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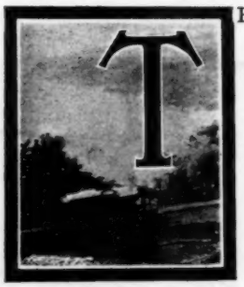
THE AUTOMOBILE

Automobile Industry Attracts Bankers

The Agitation Recently Concluded Bearing Upon the Automobile as an Economic Factor Was Foisted by Financiers, but They Must Have Thought Better of the Situation Since Nearly All of Them Went Into the Automobile Business, Thus Furnishing the Gist of This Story



THOUSANDS of the citizens of these United States believe that the automobile is a virile factor in the pursuit of happiness, and that content must be of the mind rather than of the pocketbook. To draw upon the contents of the "purse" for the purpose of paying for the commodities that make life worth living, presupposes that the purse will have within its maw a sufficiency of the evidences of "purchasing power." But money does not grow in a pocketbook, and if happiness depends upon environment, and the substance of this latter condition is only to be had at a cost, the foremost citizen, having experience, employs the best there is of facilities in his business career, thereby replenishing his purse in order that he will be in a position to draw upon the same when he goes in quest of the contrivances that are necessary to his well-being and happiness.

Keen business men found that it was particularly advantageous to use automobiles for the transportation of goods, and in such other ways as would further their business. This clever move on their part had the advantage of enabling them to make enough money so that they could afford to withdraw some of it from their business, and with it they purchased automobiles of the kind that are adaptable to pleasure pursuits, and so it would seem, the automobile is an economic factor in that it affords the very means by which the money is made that is necessary to pay the cost of the contrivances that are required by the man of industry when he bestows upon himself a period of recreation.

Why there should have been any agitation at all in relation to the economic value of the automobile art is difficult to surmise,

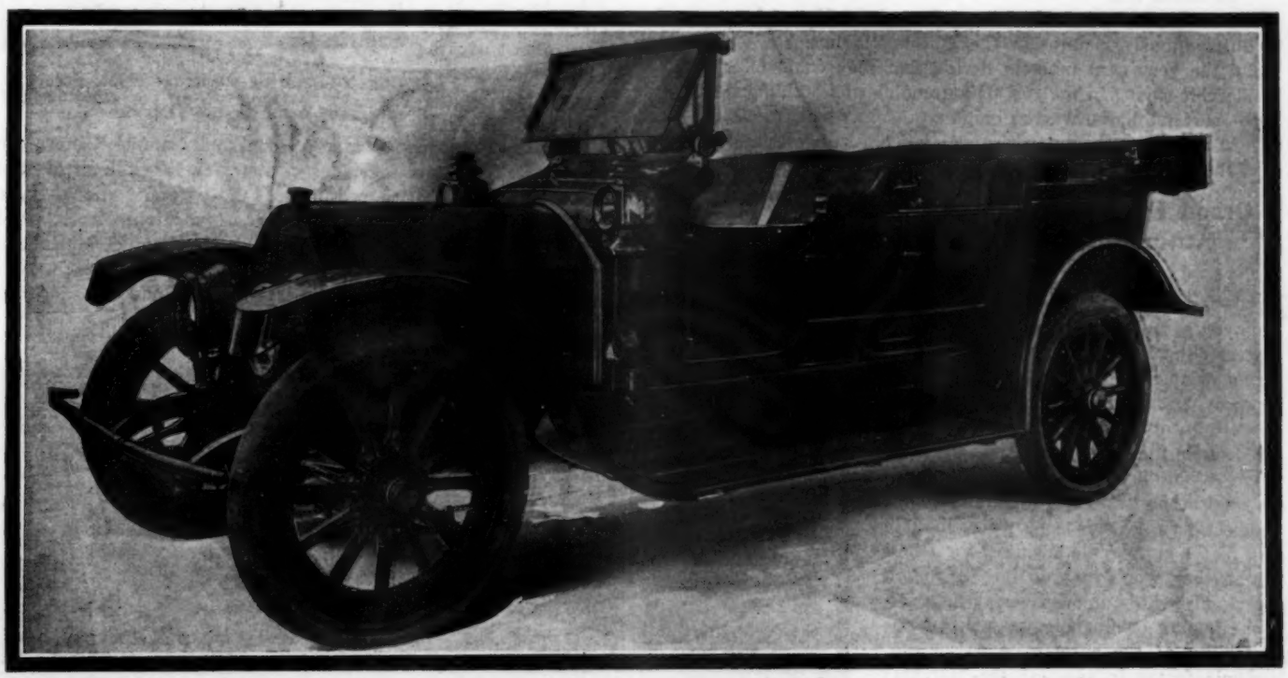


FIG. 1—THE ORSON CAR WITH SEVEN-PASSENGER FORE-DOOR TYPE OF BODY OF STRAIGHT-LINE DESIGN

but it looked for a time as if there must have been some fire, for there was a lot of smoke, and the effect was depressing upon the automobile business, due to the fact that bankers in the Middle West, taking their cue from the great financiers in the vicinity of Wall Street, contracted loans and threatened credits.

The Inherent Merit of the Automobile Situation Overbalanced All Other Considerations and Financiers of Reputation Decided to Emulate the Pioneers of the Industry

It was with feelings akin to surprise that the sturdy makers of automobiles awakened in the middle of the economic agitation

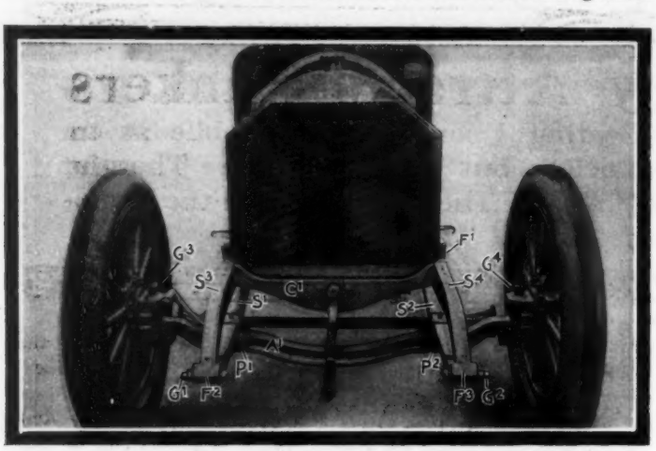


Fig. 2—Front end view of the Orson car, showing a drop I-section axle, honeycomb radiator and cross-rod to the rear of the axle

to the discovery that 100 bankers and business men had decided to band together for the purpose of building automobiles on a co-operative basis for their common good. The information that leaked out at the time was based upon the idea that good automobiles cost too much money, and that it was possible to join hands, and, by using the funds so accumulated, design and construct automobiles of a quality that might not be exceeded at a cost that would eliminate the maker's and the middleman's profit.

Comment resulted in a few keen observations. The automobile business was unable to see the point. How bankers could conscientiously claim that the automobile business is unstable, and the very next moment decide that they could effect a considerable saving in the cost of automobiles by building them on a co-operative basis, was an enigma.

At all events the enterprise was launched under the firm name of the Orson Automobile Company.

Orson Enterprise Proves Conclusively That the Automobile Business Commands the Respect of the Conservative Investor

It is believed that the story of this enterprise will be valuable to the automobile industry, first since it will prove that bankers were either insincere when they assailed the automobile business, or they were poorly informed in relation to its ramifications, or as to the good that it accomplishes in the every-day life of the average ambitious American citizen. It would be impossible to imagine that the subscribers to this enterprise thought ill of the automobile business, for otherwise they would not go into it, and it certainly will be impossible for the average banker or financier to question the stability of the automobile as an economic factor in view of the fact that this list of subscribers did go into the automobile business.

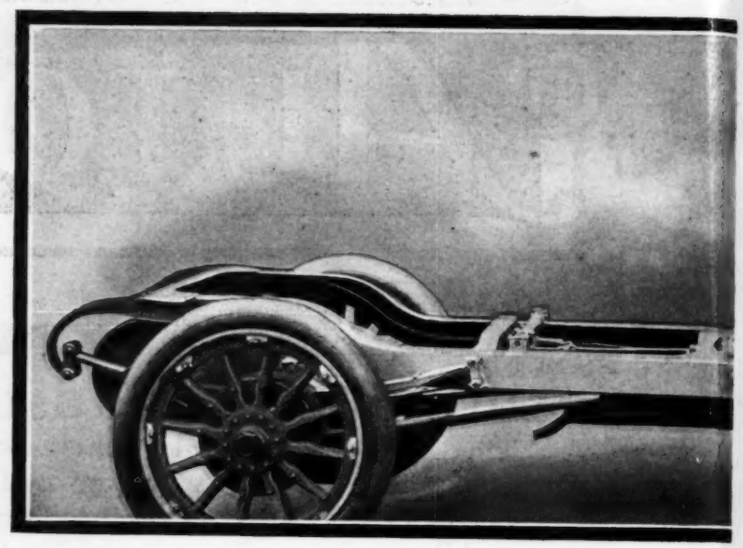


Fig. 6—Stripped chassis of the Orson car, showing a frame with a

The original subscribers to the Orson plan included 88 of New York's most respected financiers, numbering among them Mr. Frank A. Vanderlip, president of the National City Bank; Mr. H. O. Havemeyer, president of the American Sugar Refining Company; Mr. James A. Stillman, vice-president of the National City Bank; Mr. Richard Sutro, of the firm of Sutro Brothers; Mr. Charles C. Gates; Mr. Myron T. Herrick, former Governor of Ohio, and Mr. H. R. Winthrop, formerly Controller of the State of New York; Mr. W. H. Porter, of J. P. Morgan & Company; Messrs. Isaac and Samuel Untermyer; Mr. C. F. Daly, vice-president of the New York Central Railroad; Dr. E. H. Peaslee, president of the Second National Bank; Mr. Charles Blair McDonald, broker; Mr. Alvin Krech, president of the Equitable Trust Company; Mr. Samuel McRoberts, vice-president of the National City Bank; Dr. Charles F. Ash; Mr. Beinecke, proprietor of the Hotel Plaza, and Mr. Percy A. Rockefeller.

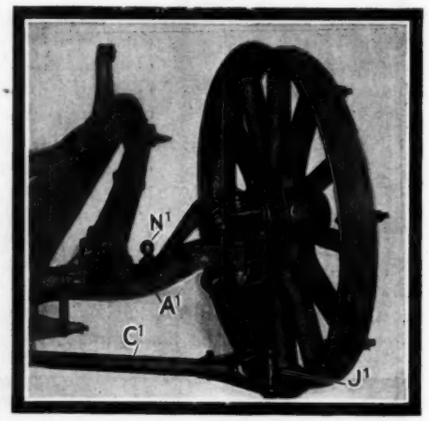


Fig. 4—Showing the front wheel assembly and the attachment of the steering and drag-rod arms to the knuckle

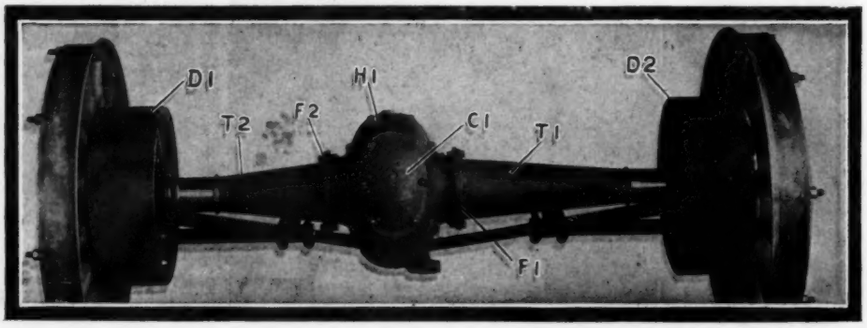
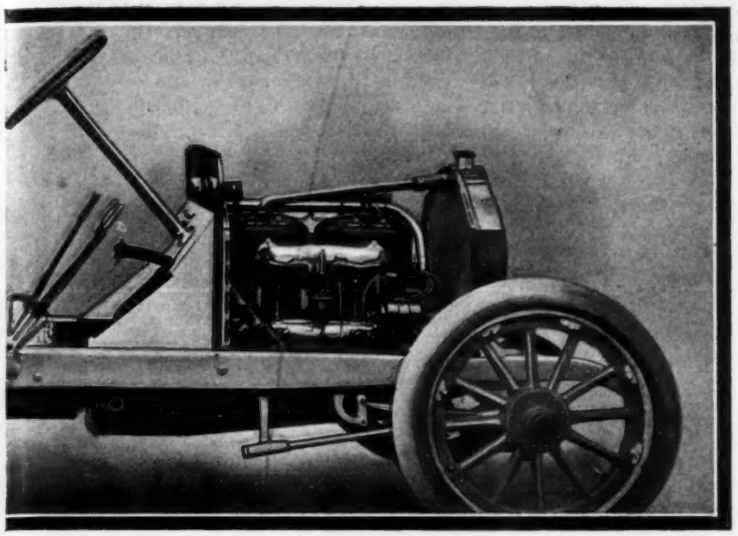


Fig. 8—Showing the assembled live rear axle of the built-up tubular type and wide brake drums



kickup in the rear with three-quarter elliptic springs

In view of the desire on the part of these gentlemen for something out of the ordinary, it was necessary for them to investigate the state of the art and ascertain what had been done, although it may be taken for granted that the subscribers were veteran automobilists, most likely, with experience dating back for several years. It is one thing to own and run an automobile and it is another matter to build automobiles that will be superior to those that pass current as they come from the regular makers. One of the early efforts was to engage the services of a capable designer, a staff of assistants, and a comprehensive organization fitted out to compete with veteran automobile builders, enjoying the benefits bestowed upon them by experience.

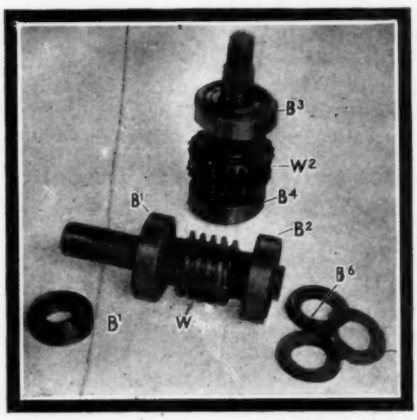


Fig. 5—Worm and sector of the steering gear, with annular type ball bearings and thrust ball bearings ready to assemble

When Mr. H. M. Kilborn called upon the Editor of THE AUTOMOBILE, leading up to the building of the Orson car, he said that the company proposed to use standardized units, but as the new car shows, this plan probably was abandoned. It may not be too much to say that it is extremely difficult for a new organization to adhere to a path as trodden by makers of parts and units. The result, in this example, is not different from the normal expectation, from the "taking" of the "germ" to build automobiles to the organizing of the force, and the decision to cut free followed in logical sequence. From what has been said, it would appear that the shop equipment was most complete. This, in all probability, resulted in a considerable cost of plans, patterns, templates, gauges, drawings and other initial costs, all of which would have to be charged to the first lot of cars, unless it is the purpose of the concern to go on and build automobiles as a regular business.

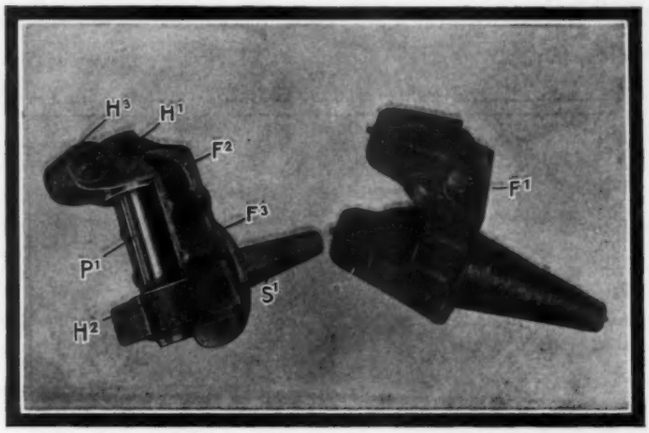


Fig. 3—Presenting the steering knuckle forging and the finished product, indicating a substantial design

Photographic Presentation of the Orson Car

What the Camera Shows of the Scheme of Design, Method of Execution and Appearance of the Finished Parts and Assemblages

DURING the many weeks of preliminary work the designers of the Orson car had to rely upon previous experience, precedent and such meager information as the literature of to-day affords, taking into account from time to time the specified requirements of those who are at the bottom of the venture, not forgetting that the building of upward of 100 specific automobiles for as many subscribers on the co-operative plan is beset by difficulties that do not have to be taken into account when the builders of automobiles in the regular way proceed on "shop order," making all the cars of a given order exactly alike in all respects, without considering the vagaries of individual purchasers. If automobiles can be built successfully on the co-operative plan as above outlined, and if good cars will result, limiting the number constructed to approximately 100, placating the individual purchasers to the extent of giving them what they think they want, and doing all of this at the price at which the Orson car is understood to sell, the makers of automobiles in the regular way are on a sound footing, and the investors in the automobile business may be assured of a substantial return on their money, while the supporters of the industry are placed in a position to accept this splendid assurance that their

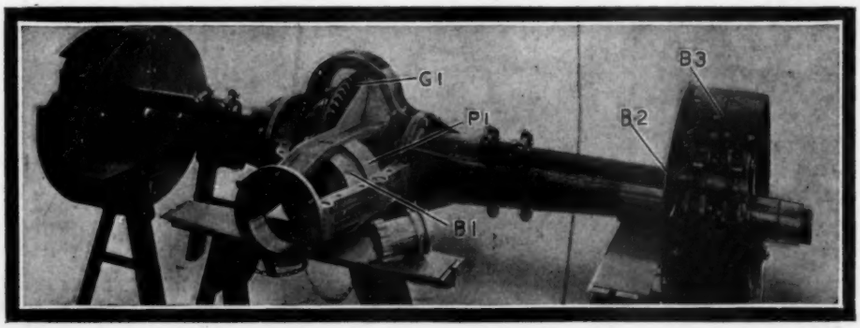


Fig. 9—Live rear axle partly assembled, showing the bevel drive, stub shaft and brake bands alongside of each other, of the internal expanding type

wants will be attended to with precision and dispatch and without risk to them.

"The proof of the pudding lies in the eating of it." That the projectors of the Orson idea were substantially right in their conjecture is indicated by the progress they have made, as shown by the illustrations here afforded. Referring to Fig. 1 of an Orson model, it will be seen that the company had a big conception, and that the car was intended to represent the modern idea in automobile building. The principal dimensions of the car will be appreciated by consulting the tabulation accompanying this article, in which it will be observed that the wheelbase is long, and the wheels are of that diameter which accords with the conventions as they relate to automobiles for general road work. The body is of the fore-door type, with an overhanging cowl at the dash, a "Mercedes" sloping of the radiator and bonnet, and flaring mudguards, with a running board set in due relation to the curb standard of city streets. The windshield of an adjustable form and an elegant design is perched upon the overhanging cowl at a point relatively near the occupants of the front seat, so that comfort in its most studied form is an assured acquisition. The entrance to the tonneau is through a wide door unobstructed by the rear mudguards or other *impedimenta*. The upholstery is most appealing in its effect, presenting an air of refinement and evidences of stability. The body accommodates seven passengers, is fitted with a top, which is shown in the folded-back position in this illustration, and down to the minutest detail there are indications of the deft hand of the designer.

The front of the car is shown in Fig. 2 presenting that refinement, which is characteristic of approved construction, with a honeycomb type of radiator flexibly mounted on a shaped cross bar C1, with a novel form of fastening F1. The front axle A1 is of the I-section, with a drop between the spring perches P1 and P2, thus affording clearance between the axle and the cross bar C1. The half-elliptic springs S1 and S2 are secured to the perches by means of two pairs of U-bolts with lock nuts on the threaded portions of the bolts after they pass through the perches, the latter being integral with the I-section axle.

Fig. 11—Showing some of the transmission gears, with splined holes to fit the splines of the shafts

Attention is called to the drop of the chassis members S3 and S4 terminating in drop forgings F2 and F3 which serve as the holders for the half-elliptic springs. Grease cups G1 and G2 are provided in the I-bolts of the springs for the purpose of lubricating the joints. Grease cups G3 and G4 are placed on the upper ends of the knuckle bolts for the purpose of lubricating the knuckle joints.

The knuckles are shown in Fig. 3, F1 being the drop forging and F2 showing the knuckle in the finished state, with a spindle S1 machined to take annular type ball bearings, with a flange F3 so made and located as to exclude foreign matter from the bearings, and a knuckle pin P1 is fitted to a hole in the forging at H1 at the top and H2 at the bottom. The steering arm is fitted in the hole of the extension of the forging at H3. The assembling of the steering knuckle is shown in Fig. 4 with a cross rod C1 at the front of the axle A1 and a large yokelike joint J1 where the knuckle arm engages the cross rod. The spherical knob N1 on the drag rod arm is above the axle A1 clearing the spring perch. Fig. 5 shows the parts of the worm and wheel steering gear with annular type ball bearings B1, B2, B3 and B4, and thrust ball bearings B5 and B6 in conjunction with the worm W1, the latter being of steel, hardened and ground, and the worm wheel W2 making up the set complete. The character of design and workmanship of the steering gear is so fittingly told in the illustration that a further description would be superfluous.

The General Scheme of Design Is Reflected in the Illustration of the Finished Chassis as Shown in Figure 6

Passing from Fig. 6 of the chassis assembly, it will be to the point to study Fig. 7, observing that the car is of the shaft drive, with a torsion tube T1 housing the propeller shaft, with diagonal bracings B1 and B2 terminating at the universal joint of the

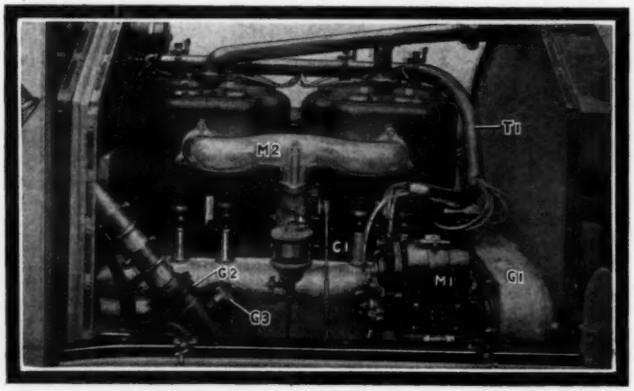


Fig. 12—Right hand side of the motor of the four-cylinder, four-cycle water-cooled type, with a magneto and carbureter in juxtaposition

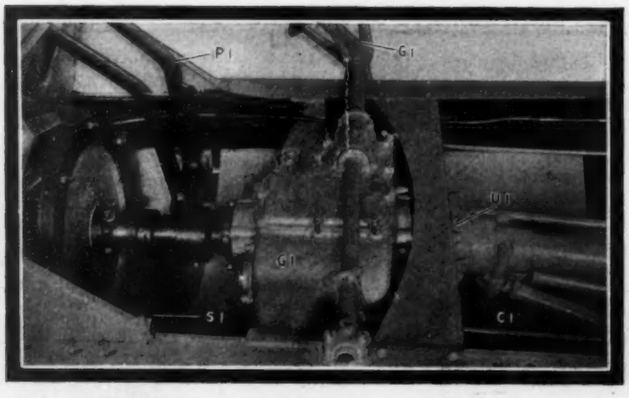


Fig. 10—Looking at the middle of the chassis frame, showing the location of the transmission gear, clutch mechanism and universal joint at the extremity of the torsion tube.

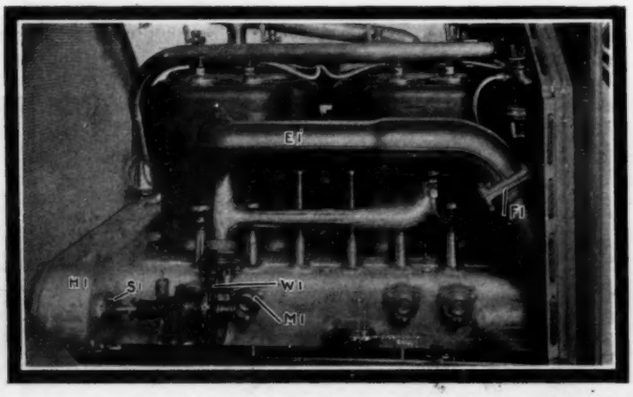


Fig. 13—Left hand side of the motor, showing the centrifugal water pump and a spring safety dog adapted to drive the same. The pressure relief valve is also shown

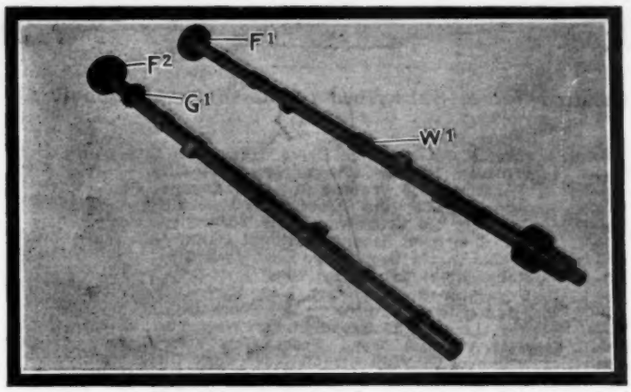


Fig. 14—Inlet and exhaust cams with integral flanges to accommodate the driving gears and the cams cut integral

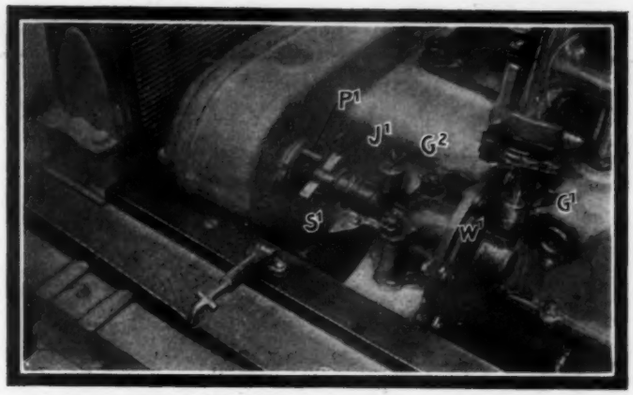


Fig. 16—Looking at the motor at the point of fastening of the centrifugal water pump, showing the safety drive

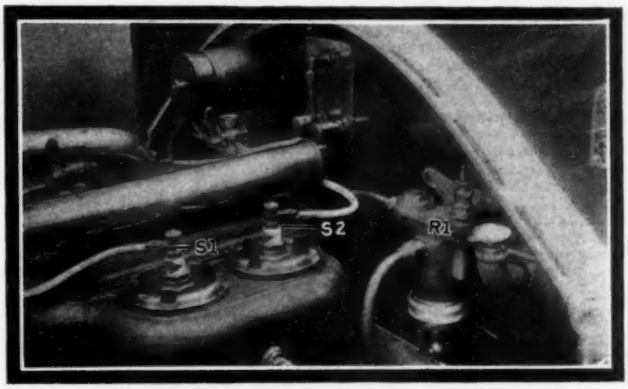


Fig. 15—Looking at the motor, showing the location of the spark plugs and the placing of the pressure regulating valve

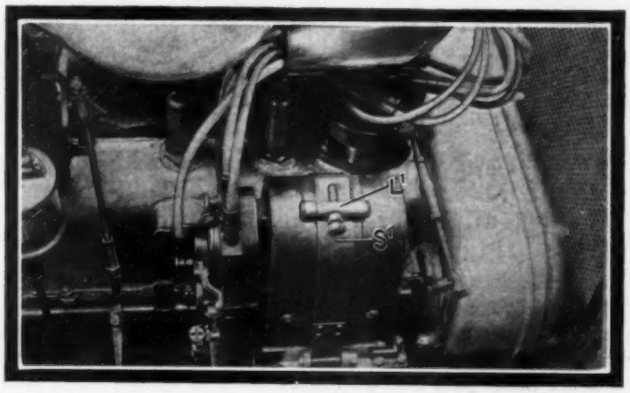


Fig. 17—Looking at the nesting of the magneto on a shelf extending out from the upper half of the motor crankcase

propeller shaft at one end and in the makeup of the actual added extremities at the other end. The chassis side members S1 and S2 are of substantial design and construction with a kickup in the rear, and a cross member C1 at a point back of the anchorage for the brake shaft B3. The brake control rods R1 and R2 are provided with equalizers E1 and E2 for the purpose of bringing pressure upon the brakebands consistent with the respective requirements and with considerable uniformity. The clamping of the levers L1, of which there are six on the brakeshaft, is along approved lines.

The rear axle assembly is shown in Fig. 8 looking from the rear, with a handhole cover C1 flanged and bolted to the housing H1 so that by removing the cover the differential set and bevel drive may be inspected, cleaned and lubricated. The axle is of the built-up tubular type, with expanded tubes T1 and T2, and flanges F1 and F2 where the fastening is made to the housing H1. The brake drums D1 and D2 are of large diameter and great width. A better understanding of the rear axle construction will be gleaned by examining Fig. 9 showing the bevel gear G1 and the bevel pinion P1, the gear being flanged to the differential housing, and the pinion being on a short spindle which is floated in annular type ball bearings B1, of which there are two. The brakes, of which there are two pairs, have their bands B2 and B3 alongside of each other, of the expanding type, within the wide faced brakedrum shown as D1 and D2 in Fig. 8.

The front end of the torsion tube terminates in the universal joint U1 at the intersection of the cross bar C1 and the transmission gear G1 is located in front of this cross bar with a quadrant Q1 for the side levers falling outside of the chassis frame on the right-hand side of the automobile. The pedals P1 and P2 swivel on a cross-shaft S1 which is fastened to the underside of the chassis frame at both sides, and motion is imparted to the clutch mechanism by means of a yoke that is secured to the cross-shaft so that when the pedals are pressed the clutch is released by one of them, and the service brakes are engaged by the other. The general character of the workmanship within the

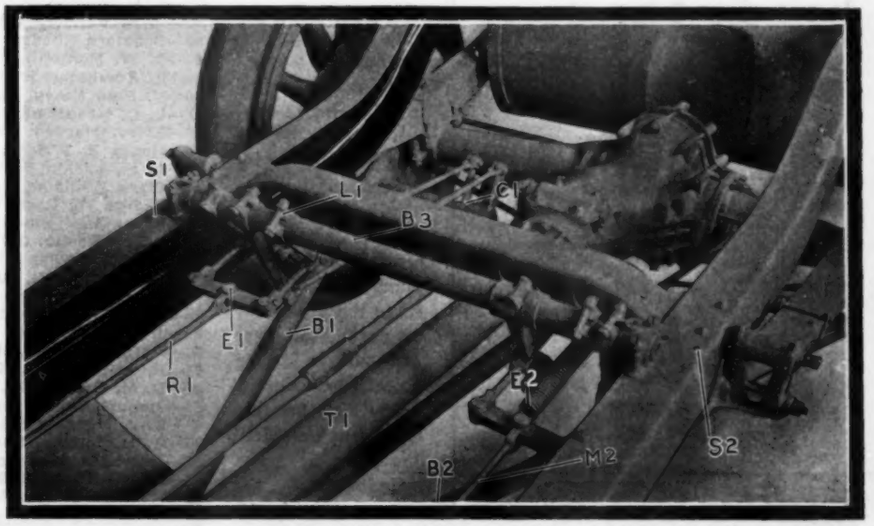


Fig. 7—Looking at the rear of the Orson chassis and the details of design of the axle, torsion tube and brake mechanisms

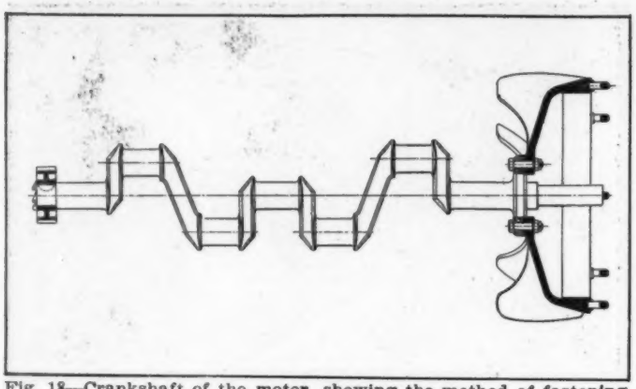


Fig. 18—Crankshaft of the motor, showing the method of fastening the halftime gear and the flywheel spider

transmission gearcase is shown in Fig. 11 of the gears and spindles. It will be observed that the gears are splined to engage the mating conformation on their respective spindles, and the teeth of the gears on the engaging edges are chamfered with care in order not to cut away too much of the bearing faces of the teeth.

Power Plant Includes a Four-Cylinder Motor with the Cylinders Cast in Pairs, Magneto Ignition System, Integral Camshaft, Centrifugal Pump and Other Refinements

Looking at the right-hand side of the motor as depicted in Fig. 12, it will be observed that the magneto M1 is placed close to the halftime gearcase G1 and the high-tension leads of the magneto pass up through a tube T1 to the top of the cylinders, and the cables pass through bushed holes to spark plugs placed two to the cylinder, distributed over the heads of the valves in the caps. The Stromberg carbureter C1 is located in the mid-position above the top line of the chassis frame, and is connected to the two pairs of cylinders by a manifold M2. The steering gear G2 is fastened to the chassis frame, and the parts that have to be adjusted are above the top line thereof, hence accessible, and a grease cup G3 is the means of lubricating the steering gear, offering the advantage of easy access.

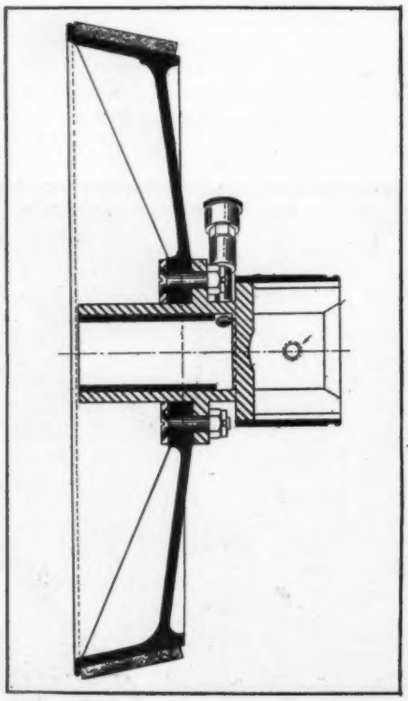


Fig. 19—Section of the cone clutch, showing the method of fastening the same to the clutch housing and the leather facing

The left-hand side of the motor is shown in Fig. 13, with a large expanding exhaust manifold E1 bolted to the pairs of cylinders, and a flange F1 at the intersection of the manifold with the exhaust pipe. The centrifugal water pump W1 is fastened to the upper half of the motor case M1 and is driven from a gear in the half-time housing H1 through a safety dog drive S1. The cylinders of the motor are of the T-head type, thus requiring the use of

Original Names Subscribed to the Orson Automobile Co.

No.	Name	Address
1	W. L. Seaich	78 Riverside Drive, New York City.
2	F. L. Whitson	1493 Broadway, New York City.
3	D. A. Pearson	1336 Walnut St., Philadelphia, Pa.
4	H. R. Winthrop	25 Pine Street, New York City.
5	Dr. C. F. Ash	115 Broadway, New York City.
6	E. H. Peaslee	care Second National Bank, New York City.
7	Chas. G. Gates	111 Broadway, New York City.
8	B. M. Fellows	111 Broadway, New York City.
9	L. B. Brown	68 Broad Street, New York City.
10	F. B. Adams	55 Wall Street, New York City.
11	J. Horace Harding	25 Broad Street, New York City.
12	E. DeWitt Walsh	3 Broad Street, New York City.
13	H. M. Kilborn	55 Wall Street, New York City.
14	W. B. Matteson (F. A. V.)	55 Wall Street, New York City.
15	Richard Sutro	44 Pine Street, New York City.
16	A. J. Seligsberg	71 Broadway, New York City.
17	D. H. Morris	68 Broad Street, New York City.
18	John F. Harris	25 Pine Street, New York City.
19	Patrick Clark	55 Wall Street, New York City.
20	Clive Runnells	Railway Exchange Building, Chicago, Ill.
21	J. N. Tarafa	Mercaderes, Havana, Cuba.
22	H. O. Havemeyer, Jr.	113 Wall Street, New York City.
23	Geo. D. Brewster	51 Wall Street, New York City.
24	Alvin W. Krech	15 Nassau Street, New York City.
25	Lyman Rhoades	15 Nassau Street, New York City.
26	Robert I. Jenks	1 Broadway, New York City.
27	C. R. Corwith	People's Gas Building, Chicago, Ill.
28	Barron G. Collier	Flat Iron Building, New York City.
29	Chas. G. Smith	25 Pine Street, New York City.
30	H. L. Jones	care Hayden, Stone & Co., New York City.
31	Walter H. Schoellkopf	303 White Building, Buffalo, N. Y.
32	C. F. Daly	Grand Central Station, New York City.
33	Julien T. Davies	34 Nassau Street, New York City.
34	Julien T. Davies, Jr.	34 Nassau Street, New York City.
35	P. A. Rockefeller	26 Broadway, New York City.
36	Myron T. Herrick	Cleveland, Ohio.
37	B. Beinecke	Plaza Hotel, New York City.
38	Alfred Cowles	Postal Tel. Building, Chicago, Ill.
39	Louis A. Lehmaier	78 Beekman Street, New York City.
40	Banks Hudson	Gadsden, Alabama.
41	J. H. Armstrong	care Brokaw Bros., New York City.
42	Henry D. Brewster	44 Pine Street, New York City.
43	John F. Talmage	25 Broad Street, New York City.
44	George D. Cross	55 Wall Street, New York City.
45	George Schaettler	533 West 34th Street, New York City.
46	Adolphe de Bary	90 West Broadway, New York City.
47	J. Bradley Cumings	36 Wall Street, New York City.
48	Chas. G. Palmer	344 West 84th Street, New York City.
49	Isaac Untermyer	37 Wall Street, New York City.
50	Willis P. Jones	149 Broadway, New York City.
51	Henry L. Wardwell	care Wardwell & Adams, New York City.
52	J. E. Judson	55 Broadway, New York City.
53	A. F. McClaine	Spokane, Wash.
54	George F. Baldwin	care Baeder, Adamson & Co., Philadelphia.
55	Samuel McRoberts	55 Wall Street, New York City.
56	A. R. Nicol	111 Broadway, New York City.
57	Major A. White	42 Cedar Street, New York City.
58	A. L. Carey	251 Fifth Avenue, New York City.
59	Nathan B. Bill	Springfield, Mass.
60	J. H. McEldowney	55 Wall Street, New York City.
61	J. H. Riehle	68 William Street, New York City.
62	F. A. Vanderlip	55 Wall Street, New York City.
63	Bradford Rhodes	Mamaroneck, N. Y.
64	C. W. Hammill	71 Broadway, New York City.
65	E. Townsend Irvin	71 Broadway, New York City.
66	N. Fred Esseg	Spokane, Washington.
67	L. C. Krauthoff	55 Wall Street, New York City.
68	E. W. Harden	36 Wall Street, New York City.
69	Henry E. Wright	31 Pearl Street, East Somerville, Mass.
70	A. H. Larkin	54 Wall Street, New York City.
71	Clark Williams	Albany, N. Y.
72	George W. Darr	115 Broadway, New York City.
73	Bryan L. Kennelly	156 Broadway, New York City.
74	W. H. Porter	270 Broadway, New York City.
75	Joseph Howland Hunt	28 East 21st Street, New York City.
76	Chas. E. Orvis	60 Broadway, New York City.
77	Richard Howland Hunt	28 East 21st Street, New York City.
78	Frank J. Griffin	116 Nassau Street, New York City.
79	J. A. Stillman	55 Wall Street, New York City.
80	Herbert N. Fell	165 Broadway, New York City.
81	R. A. C. Smith	100 Broadway, New York City.
82	D. M. Brady	95 Liberty Street, New York City.
83	Samuel Untermyer	37 Wall Street, New York City.
84	E. J. Murphy	Springfield, Mass.
85	A. H. Chapin	Springfield, Mass.
86	John W. McKinnon	25 Broad Street, New York City.
87	Henry Block	25 Broad Street, New York City.
88	Wm. M. Brown	New Castle, Pa.

Specifications of Orson Automobile

	SPECIFICATIONS	MODEL
MOTOR DATA	Horsepower, A.L.A.M.	40
	Bore	5
	Stroke	5½
	Number cylinders	4
	How cast	Pairs
	How cooled	Water
COOLING SYSTEM USED	Type of radiator	Honeycomb
	Type of pump	Centrifugal
	Kind of piping	Copper
MAKE AND TYPE OF CARBURETER USED	Make of Carbureter	Stromberg
	Type of carbureter	Double-jet
	What side of motor	Right
	Heated with	Water
MAKE AND TYPE OF MAGNETO USED	Make of magneto	Simms
	Type of magneto	S. D. 4
	What side of motor	Right
LUBRICATING SYSTEM AND TYPE OF EQUIPMENT	How oiling is done	Pump
	Make of pump	Own
	Type of pump	Plunger
	Location of pump	Left Side
	Capacity of oil tank	3 Gallons
TYPE AND LOCATION OF CLUTCH	Make of clutch	Own
	Type of clutch	Cone
	Kind of facing	Raybestos
	Location of clutch	Flywheel
TYPE OF TRANSMISSION GEAR	Make of transmission	Own
	Number of speed changes	Four and reverse
	Selective or progressive	Selective
	Location of transmission	Amidships
	Location of control levers	Right Side
TYPE AND DETAILS OF REAR AXLE	Type of rear axle	Full-Floating
	Ratio of reduction	2⅝ to 1 on 4th
	Type of differential	Bevel
	Shaft or chain drive	Shaft
DETAILS OF EMERGENCY AND SERVICE BRAKES AND CONTROL LEVERS	Location of service brakes	Rear Drums
	Expanding or constricting	Expanding
	Location of emergency brakes	Rear Drums
	Expanding or constricting	Expanding
	Facing of service brakes	Raybestos
	Facing of emergency brakes	Raybestos
	Location of service brakes control	Pedal
	Location of emergency brakes control	Side
DIMENSIONS IN INCHES OF FRONT AND REAR SPRINGS	Type of rear springs	¾ Elliptic
	Width of plates	2½
	Span of springs	52
	Type of front springs	Semi-Elliptic
	Width of plates	2¼
	Span of springs	38 Inches
TYPE, MAKE AND DATA OF FRONT AXLE	Type of front axle	I-Section
	Front or rear location of cross rod	Rear
	Steel casting, bronze, or drop forging	D. F. Carbon 35
	Drop, or straight axle	Drop
DIMENSIONS OF SIDE FRAMES	Type of side frame	Channel
	Shape of section	Channel
	Straight, double or single drop	Single
DETAILS OF THE ROAD WHEELS	Type of front wheels	Artillery
	Number of spokes	12
	Type of rear wheels	Artillery
	Number of spokes	12
	Cast, or forged hubs	Cast
DATA OF RIMS USED	Type of rims	Clincher
	Make of rims	Bridgeport
	Designed to fit what tires	Continental
MAKES AND TYPES OF THE BEARINGS USED	Make of crankshaft bearings	Cramp
	Type of crankshaft bearings	White Brass
	Type of camshaft bearings	Bronze, Phos.
	Make of gearbox bearings	R. I. V.
	Type of gearbox bearings	Ball
STATEMENT OF TIRE EQUIPMENT REGULARLY USED	Make of rear wheel tires	Continental
	Diameter of rear wheel tires	36
	Section of rear wheel tires	4½
	Make of front wheel tires	Continental
	Diameter of front wheel tires	36
	Section of front wheel tires	4½
GENERAL INFORMATION RELATIVE TO ROAD WORK	Length of wheelbase	130
	Tread of wheels	56½
	Maximum speed in miles per hour	82
	Gallons of gasoline tank capacity	30

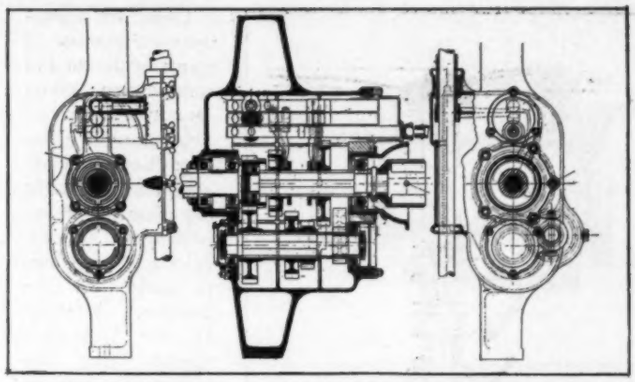


Fig. 24—Section of the transmission gear, showing the use of annular type ball bearings, splined, prime and lay shafts and details of design

two camshafts as shown in Fig. 14. This brings the valve motions, one for the inlet and the other for the exhaust, up through the crankcase and the valve springs come into view showing the details of their design and method of fastening in Figs. 12 and 13. Referring to the design of the camshafts, as shown in Fig. 14, they have flanges F1 and F2 for the camshaft gears, and the bevel gear G1 is in the integral relation, also the worm gear W1 is cut from the "solid." The cams are in the integral relation of wide face, and designed to afford the valve timing which, according to the designer, would result in the requisite measure of power for this size of motor.

In order to obtain a better view of the location of the spark plugs, Fig. 15 is furnished showing the spark plugs S1 and S2 screwed into the valve caps, with like construction on the opposite side of the motor. Remembering that the carbureter is placed above the top of the chassis frame and that a gravity feed would be inexpedient under such conditions, the designer elected to use the pressure system, and a pressure regulator R1 is shown fastened to the motor side of the dash in a position for easy adjustment. Fig. 16 shows the water pump W1 in some detail with a grease cup G1 to lubricate the out bearing, and a grease cup G2 to lubricate the inboard bearing and stuffing box. The flexible point J1 shows the spring S1, which engages the pin P1 when the pin rotates, thus imparting motion to the water-pump shaft. The object of the flat spring S1 is to impart safety, considering the possibility of the water freezing in the pump, thus locking the rotative member, and instead of twisting the shaft or doing other damage the flat spring yields, snapping by the pin, which, in addition to relieving the pressure, makes enough noise to awaken the driver to the fact that he has a duty to perform. Fig. 17 shows the magneto installation in detail, and the fastening.

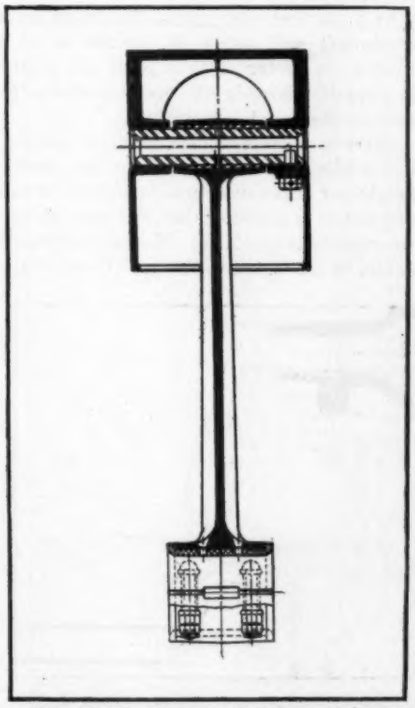


Fig. 20—Section of the connecting rod assembly, showing method of fastening gudgeon pin and light construction piston

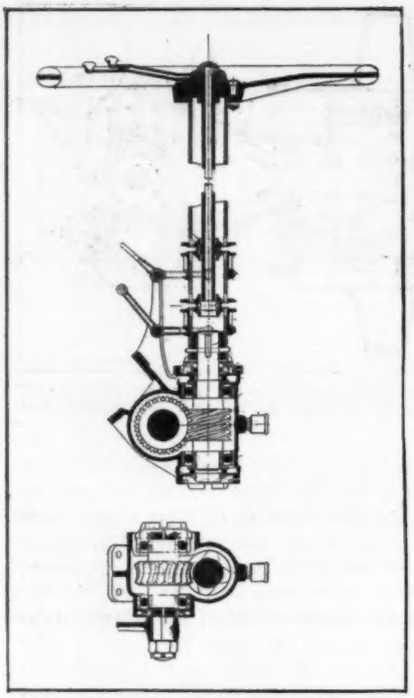


Fig. 27—Section of the steering post, showing a worm and gear mounted on annular type ball bearings with thrust ball bearings to take the work in the other plane

There are a considerable number of points of design and construction that cannot be shown by photographs; moreover the space available is not sufficient to allow of using enough of photographs or drawings to suffice for the purpose. A study of the tabulation should help the reader to appreciate some of the relations. The length of the wheelbase, for illustration, being 130 inches, suggests that the automobile will do better work in general touring service than it will in town service. The tread, being 56 1-2 inches, evidently is intended for road work rather than for treading in a car track. The turning radius of this car should be within 38 feet. In relation to the horsepower of the motor, while the table gives the A. L. A. M. rating, the fact remains that the motor may be capable of doing better. With a bore of 5 inches and a stroke of 5 1-2 inches:

$$\text{At 1,000 feet of piston travel per minute H. P.} = \frac{5^2 \times 4}{2.5} = 40$$

horsepower.

At 1,000 feet per minute of piston travel, it means that the crankshaft will rotate at slightly under 1,200 revolutions per minute. A motor to be a good one would be capable of going at a considerably higher speed, delivering power on an increasing basis as the speed is increased.

There is no information at hand relative to the weight of the automobile at it will appear on the road. Whether or not the weight per horsepower will be below the average for this class of automobile is a matter that will have to be disposed of after this information is available. The performance of the car on the road should be good, due to the use of well-shaped rear springs of the three-quarter elliptic type, especially in view of the use of superior material, of which the springs are made and to the "studied" shape of the scroll.

Details of Design of Orson Car

By Means of Photographs of the Working Drawings the Scheme of Design Is Disclosed

PRESENTING photographs of a finished automobile offers very little evidence of the scheme of design from an engineering point of view, affording advantages only on the artistic side. For the better understanding of the engineer the drawings of the Orson car have been photographed, and they are reproduced so that engineers may have information in relation to the kind of automobiles that bankers express a preference for. That the plan is an ambitious one will readily be seen, and in the whole scheme there seems to be only two disconcerting notes, one of which has for its foundation the fact that the subscribers to this plan seem to want overmuch for their money, and the second idea has to do with whether or not they will get it. It must not be forgotten that even the good appearance as shown by photographs and the scheme of design as here presented leave it open to make many mistakes in the selection of the materials and the execution of the work. It will be impossible to say that all of these mistakes have been avoided, due to the fact that "service" must ultimately tell the tale. It is on this account that the reputation of a builder of automobiles is worth more than a little, if it is a good one, because it proves quite conclusively that the high ideals of the maker are consummated.

Beginning with the power plant, Fig. 18 shows the crankshaft with the halftime gear fastened on (parallel fit) with a Woodruff key. At the other end of the crankshaft the flywheel spider with integral veins is flanged to the flywheel and buttons are inserted in a concentric relation with the holding bolts. The flywheel proper is fastened to this spider by means of studs. Fig. 19 shows the cone clutch of the leather-faced type, and the method of flanging the same to the clutch housing. Fig. 20 shows the connecting rod assembly made up of an I-section connecting rod of light construction, drop forged from steel, and a connecting rod pin hollowed and ground, fastened into the boss on one side of the piston by means of a cap screw, with a hole in the head of the same through which a wire is passed to prevent it from backing out. The piston is of light design with four packing rings, a flat head, and flanged to afford rigidity. Fig. 21 shows the detail of the starting crank and a dog on the end of a spindle, secured on a parallel fit with a Woodruff key and a

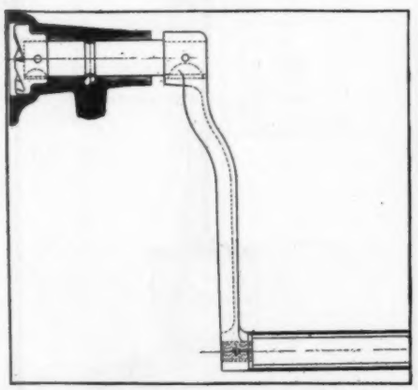


Fig. 21—Section of the extension of the front of the crankcase, showing the design of the starting crank and how the dog is fastened to the short shaft.

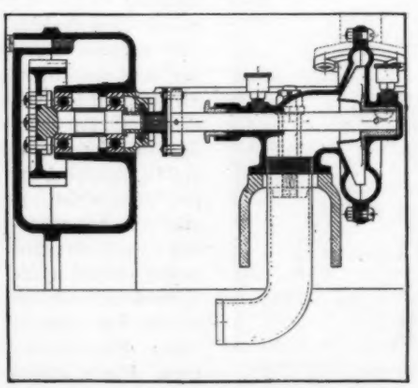


Fig. 22—Section through the water pump and drive, showing the stub shaft mounted on annular type ball bearings and the design of the safety joint

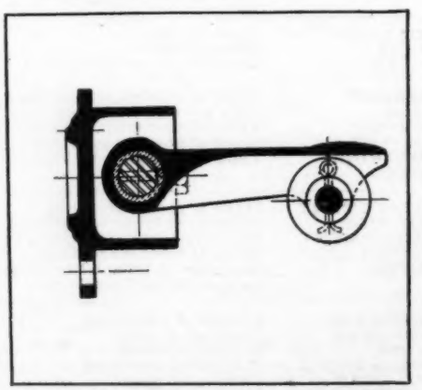


Fig. 23—Section of the valve tappet lever, showing a roller which presses against the cam and the pin on which the lever oscillates.

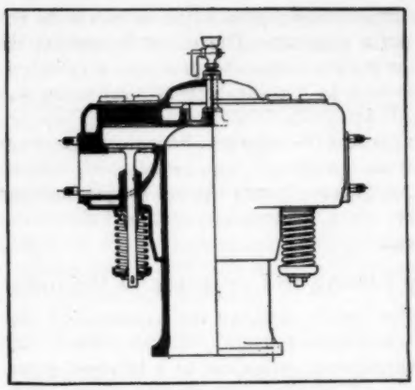


Fig. 25—Part section of a cylinder, showing the method of guiding a valve and the scheme of water jacketing

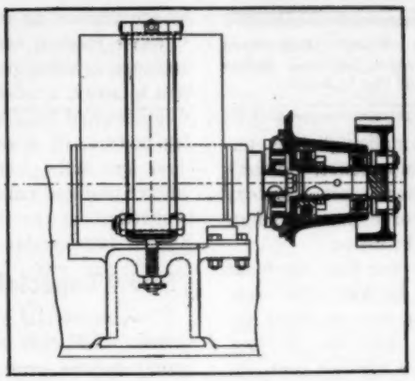


Fig. 26—Section of the driving means for the magneto, utilizing annular type ball bearings and an integral gear universal joint

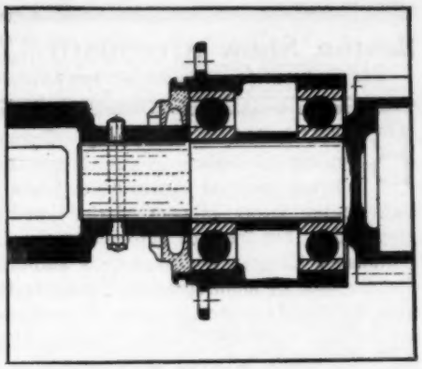


Fig. 29—Cross section through the stub shaft for the transmission gear and one member of the universal joint, showing a parallel fit and a pin in addition to a key at the joint end

taper-pin, the same construction being used at the other end of the shaft for holding the starting crank in place. The starting crank is kept from rotating when the motor is running by means of a ball pressed up by a spring engaging a depression in a slot.

The water pump assembly is shown in Fig. 22 with a vein fastened to the shaft by means of a Woodruff key and a taper-pin. The pump is prevented from leaking by packing that is compressed by screwing up on a gland that terminates in a hexagon head. The flat spring drive is held to the shaft by means of a taper-pin. The stub shaft is flanged at one end, holding the driving gear, and floats on a pair of annular type ball bearings with a short spacer between them. Fig. 23 shows the valve tappet lever oscillating on a pin which is assembled in a cap, the latter fitting in a hole in the crankcase. The roller on the other extremity of this lever engages the cam on the camshaft.

The transmission gear is shown in Fig. 24 sectioned through the gears showing the integrally splined prime and lay shafts floating on annular type ball bearings, and the method of obtaining two direct drives through the use of an internal gear engaging teeth on the wing of the master gear. The third and fourth speeds are obtained by altering the engagement of an intermediary coupling in the rear axle which has an outer and inside gear cut out of the solid. This coupling commands the two sets of bevel wheels and is operated by the same lever as the main transmission. One member of the universal joint is fastened to the shaft, parallel fit, with a key and a taper-pin, the latter being held in place by a nut threaded onto the small end of the taper. The annular type ball bearings are held in housings without inside closures. There are other refinements that will be obvious to the engineer. A cylinder in part section is shown in Fig. 25, with one of the valves indicated in the sectioned valve chamber presenting a bushing as a guide for the valve stem, and an effort on the part of the designer to limit the height of the motor by reducing the water space around the seat of the mushroom. The magneto drive is shown in Fig. 26, and the interesting feature in this construction is the use of an integral gear flexible joint between the magneto and the stud shaft drive, the latter being short, floating a pair of annular type ball bearings, and flanged at the driving end for the accommodation of the driving gear.

The steering gear is presented in section in Fig. 27, showing how the annular type and thrust ball bearings are held in place, and the concentric assembling of the members, ending in a large diameter steering wheel, with a spark and throttle control on the top thereof. The details of the side levers and shift are presented in Fig. 28, showing a concentric set, remembering that the side lever for the control of the sliding gears must shift laterally through the bearings as indicated, and that pressure from the emergency brakes comes on at right angles thereto. Fig. 29 shows the assembly of the stub shaft through which power is transmitted from the transmission gear to the live rear axle. There are 52 ball bearings in the model.

Disassembling a Car

Care Should Be Taken to So Mark and Place the Parts That They May Be Put Together Correctly and Rapidly

IN the process of disassembling the car, all the parts should be properly marked or so tagged that they may be readily identified in the subsequent assembling process, and the halftime gears spotted and identified so that they may be readily put back into place, thus eliminating unnecessary labor, and the chances of future trouble. It is believed that this careful process of taking the car apart, cleaning all the pieces, and lying them down in a light and accessible place, is likely to have a wider influence on the quality of the work, and the cost thereof, than anyone would readily realize. It costs a considerable amount of money to have skilled workmen searching for lost parts every time they make a move, and obviously in the absence of a system of this sort, all the parts are lost all the time, because if they are not in a definite known place, they have to be searched for when they are wanted.

The average repair man, if he makes a jumble of the parts, is enough of a machinist to reproduce them readily, and it is much more of a pleasant task for him to reproduce a part than it is to make a diligent search in a disorderly arranged pile of parts. Everything in connection with repair work indicates that an orderly array of the members after they are properly cleaned and inspected, is one of the best investments that can be made, and the first principle of good repairing lies in this one idea.

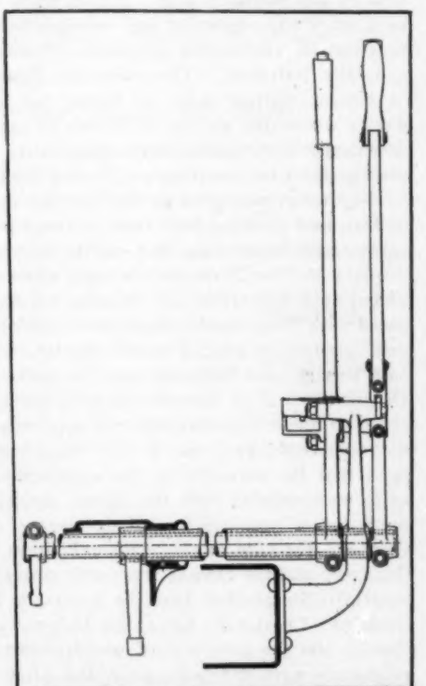


Fig. 28—Part section of the side levers and mechanism, showing a concentric relation of the sliding gear shaft to the brake shaft

Boston Show Aftermath

Ninth Annual Exhibition Outclasses National Shows in Many Respects—Opinions of Some Leaders of the Industry.

BOSTON, MASS., March 13—"Outnationalizing" the national exhibitions in size, if not in importance, Boston's Ninth Annual Automobile Show closed on Saturday night to the accompaniment of the time-honored pandemonium produced by hundreds of automobile signals in action.

Manager Chester I. Campbell is authority for the statement that the total of admissions will reach nearly 115,000. The three huge buildings required to house the exhibition were at times uncomfortably crowded. Even "Society Day" saw the previous day's attendance bettered, notwithstanding the 100 per cent. increase in the admission price.

Despite the numerous social features which always attend Boston's automobile exhibitions, the show was a "business" affair, pure and simple. The auto-wise of all New England gathered here and planned for the coming year. Agents and sub-agents from the remotest parts of the district were on hand, and during the early part of the week many company officials of nation-wide reputation were on hand to meet their New England assistants, and look over the show. Indeed, so "national" was the aspect of affairs from this viewpoint on Tuesday and Wednesday especially, that the Bostonese are insistent in claiming that their show is no longer a local one in the usual sense. With its 66,000 square miles of territory, New England now boasts not far from seven and a half millions of inhabitants, and the Boston show has become the representative annual automobile exhibition of this section, with its huge and growing population. In the sense that the Garden exhibition is the "National" Eastern show, and the Chicago exhibition that of the West, the Boston affair is the national show of its particular section—thus argue the Bostonians. And there is reason in their argument. Last week's show was the largest ever held in this country, according to the estimates of the projector.

Business Results Were Most Gratifying

A rapid canvass of the exhibitors in all three buildings indicated that from a business standpoint the exhibition far exceeded that of any previous year. Actual sales were too numerous to keep track of. Agencies and sub-agencies were established and renewed in astonishing numbers. Accessories exhibitors were generally "satisfied." The claim that New England is essentially "a big-car district" was not borne out by the results of the week's work—for all the exhibitors of cars ranging from $1,250 downward were particularly enthusiastic over the outlook for their product in New England during the coming twelvemonth.

The Boston managers profited by the experience of other promoters, and confined their show to one week. Commercials were represented in numbers and quality to equal, if not exceed, the displays at New York and Chicago, while considered in the light of business done, it is not claiming too much to state that compared with those shows, the Boston exhibition more than held its own from a commercial car standpoint.

It was against the judgment of some of the managers that Horticultural Hall, four blocks away from the big show, was secured to house the eleventh-hour applicants for space for whom no room could be found in the "main tent." But it has developed that the majority of the supposed-to-be unfortunates are quite well satisfied with the week's results. They found that a much larger proportion of their visitors were on business bent than was the case at the main exhibition, where the glamor of the music and the crowds frequently proved a detriment. It was at Horticultural Hall that the Lenox, a Boston-made car, was installed. Chester T. Bates, the designer and engineer, admitted that at first the prospects of properly introducing his car to his neighbors were decidedly poor, but after two days' experience "up the street," he and his assistants were quite well satisfied, as were the other exhibitors in the overflow show. The Lenox, by the way, is an attractive-looking proposition in two body designs—a touring car and a roadster. The motor is identical in both cases, being on the lines of standard practice—4 cylinders, cast in pairs, 4 1-8-inch bore by 5 1-4-inch stroke, valves on one side operated by a single integrally forged camshaft. The touring body is of most artistic five-passenger, fore-door construction, and sells, completely equipped (top, windshield, speedometer and gas tank), at $1,800. It was the newest pleasure-car proposition at the show. One hundred cars will be built at the Boston factory this year.

Show Especially Strong in Commercial Wagons

The commercial section, which occupied the basement of Mechanics' Hall, was an exhibition in itself. No less than 37 different makers were represented, with close to a hundred separate vehicles and chassis, of gasoline and electric construction, in evidence. Enthusiasm over the prospects for the coming year was decidedly manifest in a hurried canvass of the exhibits. W. L. Russell, at the Morgan stand—the Morgan is a New England proposition, by the way—was particularly encouraged over the outlook. "We are straining every effort to increase our output, with proper regard for continued excellence, for we foresee that within two years the demand for business wagons will exceed the supply." Other exhibitors spoke in a similar strain.

One of the newest things in the commercial section—for all of it is new, comparatively—is the Harrison gasoline truck, built in South Boston, and including many features peculiarly its own. It is built in three models—B, 3 1-2 tons; F, 5 tons, and J, 12 tons. Nothing is apparently left to chance in the Harrison—double radiators insure perfect cooling; two systems of ignition and two sets of spark plugs are employed. Injury from strain or twisting of the main chassis frame is obviated by a special three-point suspension of the motor and transmission, further amelioration of shocks being obtained by the use of auxiliary spiral springs in conjunction with long semi-elliptic springs. Long wheel-bases are features of all three models—116 inches in the 3 1-2-ton; 132 inches in the 5-ton, and 155 inches in the 12-ton—thus allowing the truck to be easily handled in narrow or crowded streets. The crankshaft of the four-cylinder motor, which is used on the 3 1-2-ton model, is provided with five bearings, while that of the six-cylinder motor, with which the 5- and 12-ton trucks are equipped, has seven bearings. Fourteen of these trucks have already been built, and they have made such an impression on prospective buyers that arrangements will be entered into at once to increase the rate of output.

The extent to which the Knox Automobile Company—a pioneer New England concern—is specializing in motor fire apparatus has had not a little to do with popularizing this method of fire-fighting. Sales Manager Charles R. Culver was especially enthusiastic over this particular branch of his company's business. Municipalities in search of equipment along this line, he said, may now secure it complete from the Knox factory, which builds its own powerful pumps specially designed for the purpose. He ascribed the phenomenal success of the Boston show to the fact that it is held when the people are ready to entertain propositions along the pleasure car line. "There is nothing like snow and hail to make a man forget about automobiles. Spring and green grass is the winning combination. A late show date is the answer." The Knox Company will turn out about 1000 1911 pleasure cars.

Columbia Taking Care of Its Clientele

Another New England concern, the Columbia Motor Car Company, is proceeding along up-to-date lines to make and retain business. Among the recent innovations, said George A. Crane, of the company's sales force, is the establishment of a road department, at considerable expense, whose members will travel throughout the country wherever Columbias are sold and used, and see to it that every new car is performing satisfactorily or discover the reason why. By thus attending promptly to minor defects, brought about possibly by lack of

skill or by recklessness, Columbia owners become wedded to their cars and will have nothing else. This department has already paid for itself several times over. The Columbia is becoming popular in the South owing to the company's decision to build, on demand, special wide-tread cars suitable to the wider wagon tracks in that section. The Locomobile Company of America—another leading New England factory, through its Boston manager, K. M. Blake, reports marked progress. Mr. Dowd, from the factory, says that about a thousand 1911 cars will be built, of which about 70 per cent. will be sixes—figures which, as compared with last year, show a slight gain in the proportion of six-cylinder cars produced.

New England Becoming Market for Small Cars

New England may be primarily "big-car territory," but it is safe to say that another year or two will witness the established popularity of the smaller car—the real little fellow—throughout this section. This was borne out by last week's experiences of the Brush and Motorette staffs. Both these cars—the latter a New England product—seemed to appeal particularly to large numbers of visitors, and actual sales and promising "prospects" were liberally recorded throughout the week. Several agencies were established for the latter in Massachusetts and New Hampshire, and as the demonstrating car was doing quick-turning stunts on Huntington avenue all day long its movements were watched by thousands going to and from the show.

Walter White, who spent the greater part of the week at the show, is enthusiastic over the motor truck outlook. He believes that within a year or two those who have freight to haul will be compelled in sheer self-defense to use the faster and better method. The one great drawback to-day, in his opinion, is that so few concerns have any statistics that will give a line on the actual cost of their hauling operations. "The cost per ton-mile," he said, "is the only information upon which to base a comparison, and the actual cost where horses are used is two or three times higher than the owners of the business believe it is. The moment they can be induced to keep tabs on the actual cost, from that moment the ultimate substitution of motor trucks for horse-drawn vehicles is assured."

Many Festivities During the Week

President Hugh Chalmers attended the show early in the week. He complimented the management on the result of their hard work and characterized the show thus—"as grand a collection of thoroughly practical, capable and efficient motor vehicles as has even been placed under one roof at any one time."

Al Reeves and Sam Miles were at the show on Wednesday—getting points for New York and Chicago next year. "Military Night" on Wednesday looked like any other night. Although there was quite a large number of uniforms in evidence, they were lost in the huge crowds which flocked into the buildings.

The big day of the week was "Commercial Car Day," on Thursday, for while the usual pleasure car clientèle was out in force, the commercial contingent flocked into the show in such numbers all day long that the round of the exhibits could not be made with any degree of comfort.

The annual "Show Week" dinner of the Massachusetts Automobile Association was held at the Hotel Somerset Thursday night. President A. D. Converse was toastmaster. President of the State Senate Allen T. Treadway and Chairman Harold Parker, of the Highway Commission, were among the speakers.

The New England agents of the United States Motor Company held a meeting at the Boston office on Thursday afternoon. The sales outlook for this territory for 1911 was informally discussed. President Benjamin Briscoe, H. W. Nuckols, of the Columbia, and D. S. Fenner, sales manager of the Alden-Sampson Company, and Frank J. Tyler, manager of the New England branch, addressed the meeting, after which every member present was called upon to give an outline of the condition of affairs in his special territory.

There was a "café chantant" for all hands in the main dining room of the Lenox Friday night. The affair was remarkable for the large number of ladies present.

After the show on Saturday night there was a "family reunion and midnight dinner" of the Velie contingent in the Red Room at the Hotel Lenox. Mayor Fitzgerald was one of the guests. Morton H. Luce acted as toastmaster.

Governor Foss was an interested show visitor on Wednesday night. He was accompanied by Mrs. Foss, their son, and daughters, besides a dozen or more aides in uniform.

Denver Automobile Show Opens

DENVER, COL., March 14—With by far the most complete line of cars and accessories ever shown in the mountain section the annual automobile show opened to-night at the Auditorium.

G. A. Wahlgreen promoted the event and is acting as manager. The complete list of exhibitors is as follows:

Tom Botterill, Pierce-Arrow, Pope-Hartford, Columbus Electric, Mathewson Auto Co., Locomobile, Oldsmobile, Oakland, Ohio Electric, Thomas, Reo; McDuffee Motor Car Co., Chalmers; E. R. Cumbe, Rambler; Fernald Auto Co., Maxwell, Columbia; Western Marion Co., Marion; Krebs-Covington, Hupmobile, Detroit Electric, Lozier; W. W. Barnett, Stoddard-Dayton, Alco; Felker Auto Co., Stevens-Duryea, Waverley Electric, Hudson; John Deere Plow Co., Velie; Colorado Auto Co., Cadillac; Colorado Motor Sales Co., Marmon, Peerless; MacFarland Auto Co., Buick, Packard; Havens Motor Car Co., Dorris; Charles Bilz, Franklin; Metzger Motor Co., Everitt; Overland Auto Co., Winton, Overland, Apperson, Baker Electric; J. I. Case Threshing Co., Case; Ford Auto Co., Ford; F. A. Trinkle Auto Co., Brush, Alden-Sampson; Hinkley Investment Co., White; Terrace, Fritchle Electric; Stanley Motor Car Co., Stanley Steamer; Denver Regal Auto Co., Regal, Bergdoll; Elmore Auto Co., Elmore; Colburn Auto Co., Colburn, Renault; Colorado Inter-State Co., Inter-State; Kissel Motor Car Co., Kissel; Wilson Auto Co., Mitchell, Firestone-Columbus, Empire; Swanbrough & Co., Hupp-Yeats Electric; Timpte Bros., Moon; Denver Rock Drill and Machinery Co., compressors; Jackson & Wood, electric automobile lights; Continental Oil Co., automobile oils; Colorado U. S. Refining Co., automobile oils; L. V. H. Tire Co., treads; Havens Motor Car Co., autogenous welding; Chief Battery Co., dry cell battery; Carstarphen Electric Co., vacuum cleaner; Keystone Lubricating Co., Keystone greases and oils; Brackett Welding Co., oxyacetylene welding, Duplex multi-spark plug; F. W. Standart, automobile insurance; Boss Rubber Co., vulcanizing plant; Fry & McGill, accessories; Auto Equipment Co., accessories; Denver Auto Goods Co., accessories; Great Western Oil Co., No-Karbo oil; Colorado Tire and Leather Co., treads; Nock & Garside, elevators; Cahn Electric Co., electric motors; Denver Auto School, auto school; Independent Oil Co., automobile oils; Howe & Johnson, vacuum cleaner and electric vibrator; Pratt Brothers, book store; W. W. Barnett, Stoddard-Dayton truck; Charles Bilz, Franklin truck; Vulcan Power Wagon Co., Grabowsky truck; Trinkle Automobile Co., Brush truck; International Harvester Co., I. H. C. pleasure car and trucks; Denver Rapid Car Co., Rapid truck; Van Dyke Motor Car Co., Van Dyke truck; Timpte Brothers, Chase & Gramm trucks; Stephenson Truck Co., Alden-Sampson truck; Mathewson Auto Co., Reo truck; Fritchle Auto Co., Electric truck; Denver Omnibus and Cab Co., finished automobile body; Kissel Motor Car Co., Kissel trucks; Seitz Detroit, Seitz trucks; Havens Motor Car Co., Frayer-Miller truck; MacFarland Auto Co., Packard truck.

Big Entry for Quakers' Run

PHILADELPHIA, March 13—The Quaker City Motor Club set the ball rolling for the inauguration of the spring season last week when entry blanks were issued for the fourth annual sociability run of the club to be held on Saturday, April 29, to Atlantic City. The response by motor enthusiasts has been most gratifying, nineteen entries having been received up to this afternoon, a criterion that forecasts a shattering of all former records of the club as to participants. Fred C. Dunlap has been appointed chairman of the Contest Committee having the run in charge, the other members of the committee being: George M. Graham, Paul B. Huyette, Charles J. Swain, Charles Stead, J. C. Bartlett, G. Wilton Gantert and Evans Church. The run is described as "a pleasure run, within the law, over good roads, to the greatest seashore resort in the world."

Savannah Club Elects Officers

SAVANNAH, GA., March 13—At the annual meeting of the Savannah Automobile Club, which took place last night, Harvey Granger, who has been on the executive committee for four years, was elected as president. J. J. Rauers who was vice-president would not stand for re-election and O. T. Bacon, for a number of years one of the county commissioners, was elected A. W. Solomon was re-elected as secretary and treasurer.

Automobile: Invaders' Mainstay

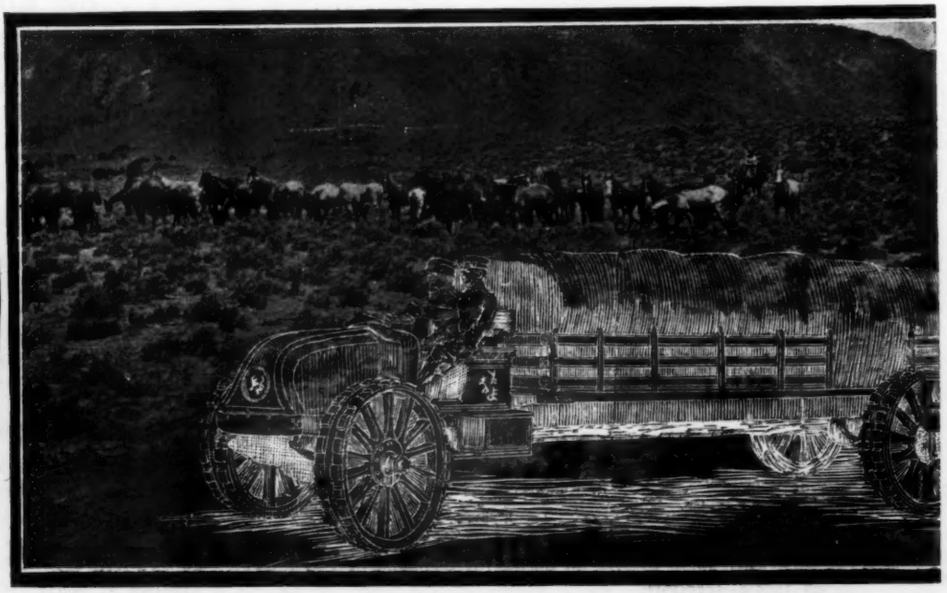
A Fiction, Intended to Convey the Idea That a Vigorous Enemy Might Hold a Great Advantage if the American Army Continues to "Crawl On Its Belly"

WITH the advance guard before Socorro, New Mexico, March 10—(Special by bearer to the *Shinpo, Ji-Ji*, Tokio, Japan). The advance guard of Kuro's flying column reached here at ten o'clock this morning, a distance of 1,000 miles from the point where it crossed the Mexican border through a defile in the Sierra Madre mountains, touching the intersection of Mexico, Arizona and New Mexico. According to the information available, the column might have turned to the left, passing through the foothills to a flat lowland, but the enemy held this position with a small force to guard the water at Willow Creek, whereas by turning to the right through Guadalupe Cañon, it was an easy and unobstructed progress, with the towering mountains on both sides, and barely room enough for the automobile squadrons to pass, with here and there a great boulder that had to be moved to clear the way. It was fortunate that our honorable engineers foresaw these conditions, providing grappling hooks, Spanish tackle, and a "winch" on each automobile, by means of which, utilizing the power of the motor, the boulders were readily moved out of the way. At a point where a great hanging rock darkened the bottom of the cañon, it looked as if the squadron would be unable to get by, but the Information Bureau, which has been operating in this district for more than a year, assured our honorable commander of the feasibility of this route, and true to the information afforded, the automobiles were able to traverse this narrow and obstructed part of the cañon with barely 2 inches to spare.

My last dispatch told you how we made an uneventful landing at Guaymas, and how the natives, who, by the way, are crude, supposed that we were going to land at Topolobampo. From the landing at Guaymas, the traveling thence to Hermosillo was along the railway track and through a valley, the nature of which is too tropical for comfort, although its beauty is of that wild character which is almost beyond description. At Hermosillo, which is the capital of Sonora (one of the Mexican States), the Governor and his staff welcomed his Imperial Majesty of Japan's flying column, presenting to General Kuro the key to the city. The pause of six hours during the welcoming ceremonies was taken advantage of by the main body in making detailed preparation for the wild advance up through the Sonora valley, following a railway line that extends in the northerly direction through Camou, Liano, Magdalena, passing to the left of Cananea, but instead of continuing on to Nogales, on the American side of the line, the column turned to the right and continued on until it crossed the line in the foothills below Willow Creek.

As we paused for a much-needed rest at a point known as Leer's Creek in the cañon, we picked up a dispatch bearer who made his way through the enemy's lines from our headquarters in California, and he reported that the 50,000 veterans who came to California in the disguise of laborers during the last two years were assembling in the vicinity of the Needles, California, and that they would destroy the Atlantic and Pacific Bridge at this point, and with a heavy rear guard at Peach Springs, the main body would press on in the easterly direction over the Atlantic and Pacific railway, establishing headquarters at Bill William's Peak, and the advance guard would form a junction with our flying column at Albuquerque.

Passing out of the Guadalupe Cañon without serious incident and without having discovered signs of the enemy, which merely went to show that our honorable competitor was totally uninformed as to our intent, we reached a level country, which, ac-



DEPICTING AN INVADING ARMY IN THE SAGE-BRUSH COUNTRY OF THE WEST, USING SLOW-SPEED AUTOMOBILES OF OR SUCH SUPPLIES AS AN ARMY

cording to the maps prepared by our Bureau of Information was known as the Cloverdale Flat, over which the going was barely equalled by the paved streets of the great cities of this marvelous country.

After 90 miles of traveling at the full speed of the squadron's automobiles we reached a mountain pass known as the "Sugar Loaf" where we found a bounteous supply of water, which seems to be the only shortage in this part of America, but it is this very absence of water that makes it possible for the automobiles to traverse the great expanses of sand flats almost devoid of vegetation, excepting for a type of tuft grass and sage brush. It was a great wonder to us that this pass in the mountains was not fortified, but finding a ranch close to the north side of the opening in the mountains we took the inhabitants thereof with us for safe keeping.

Our maps indicated that our next day's travel would take us to the railway track at Wilcox, Arizona, crossing a great sand flat, keeping the Cochise Mountains on the left and a towering peak that rises out of the sand on the right. We reached the railroad in the evening and took Wilcox, Arizona, without firing a shot. It was not our plan to lose any time at this uneventful place but to press on, destroying the railroad for a distance, taking Stein's Pass, where the railroad enters a mountain range on its way to the east and north by way of Deming, New Mexico. The advance guard made the pass without any resistance, and planted one piece of heavy artillery with 40 men and a machine gun to hold this position pending the arrival of the main body.

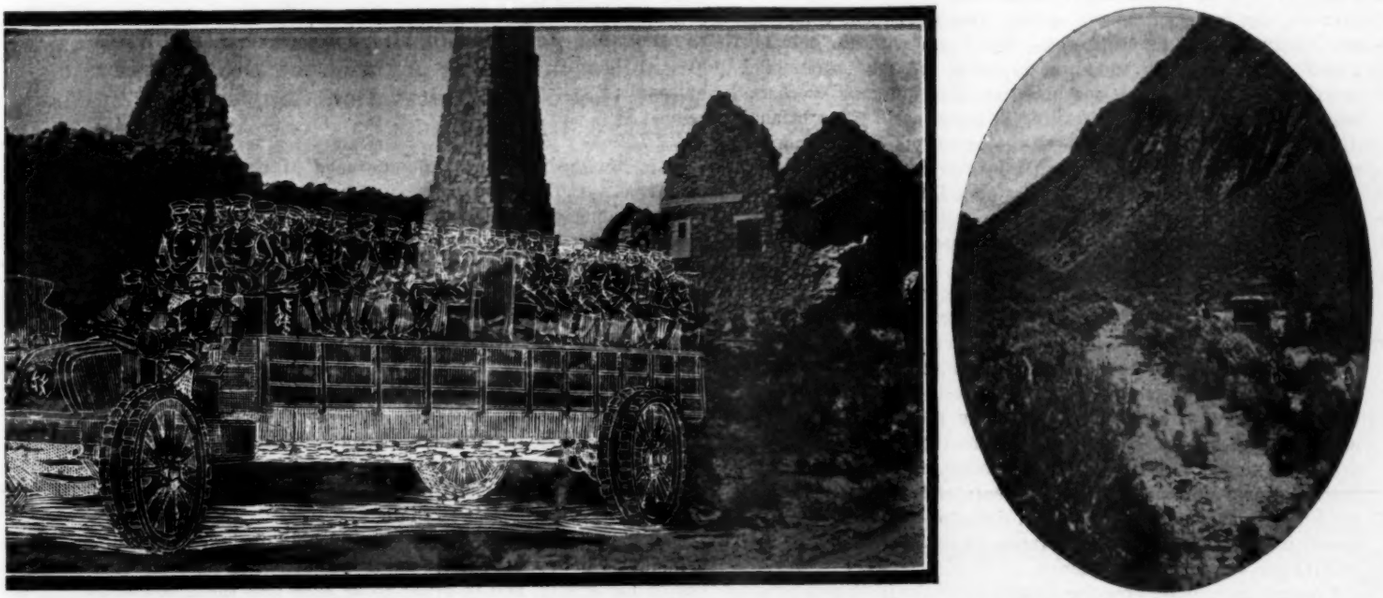
It was a great wonder to us that no resistance was offered to our passage through these many difficult situations, but we learned by tapping the wire, and from other sources of information—among them newspapers at the railway station at Wilcox, that the American forces were concentrated at San Antonio, Texas, excepting for the balance of the small American Army, which, according to our information, had not been mobilized, and it occupied the position of scattered companies, nearly all of which were located on the Eastern seaboard adjacent to metropolitan centers—a happy situation, as one of our honorable general officers put it, since it afforded to the officers of that part of the American Army so placed a fine chance to see life.

But this may prove of advantage to us. It is a great thing to have the means for the rapid movement of the man and the means, including everything, making the army self-contained, and it is this advantage that we hold over our honorable competitor at this writing. On several occasions, when we overtook touring cars of the ordinary kind stuck in the sand, we were placed in a position to appreciate the fact that our engineers knew what they were about when they designed our automobiles.

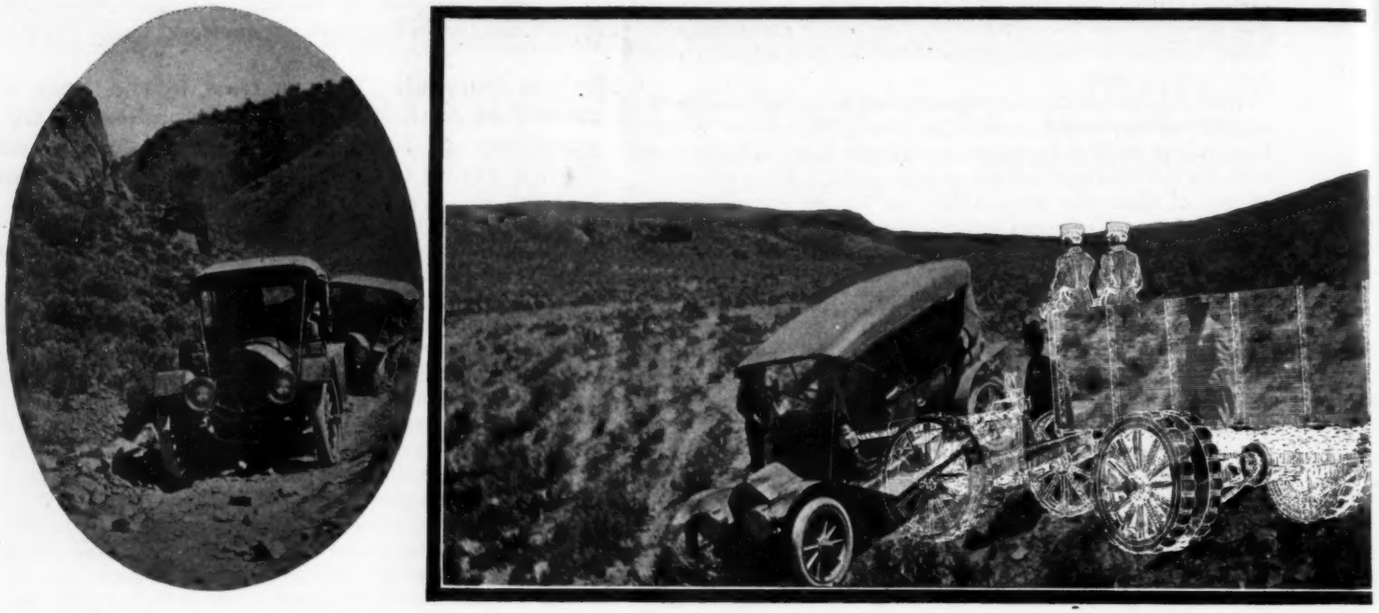
Mexican Imbroglio Throws Dust in the Eyes of American Authorities, Giving Japanese an Opportunity to Land an Organized Force and Throw Flying Column Across from the Mexican Line to the North, East of the Great Divide

The plan of campaign of the Imperial Japanese Army in America was not made plain to any of us until it was consummated. The whole situation is now as plain as day. The Bureau of Information, having furnished very accurate data of the topography of the American Continent along the Mexican border adjacent to the Gulf of California and to the north following along the east side of the Rocky Mountains, made it possible for our honorable engineers to design automobile trucks that would be capable of traversing every foot of the way without impediment. I was somewhat apprehensive owing to the fact that in the last four or five years while I was stationed in San Francisco I read in the American newspapers of the wonderful feats of the automobiles that passed from the East to the West, crossing this very country, and according to the newspaper publicity that was continually going the round of the press, the impression was gathered that the going was utterly impossible excepting for some superhuman being equipped for the occasion with some particular make of automobile. Imagine our great surprise when I discovered that our service automobiles equipped with large diameter wheels, heavy powered motors, and designed to travel at a speed of four miles per hour on the average, made six miles per hour over the sand flats of Arizona and New Mexico, and reached the considerable speed of ten miles per hour on railroad tracks.

When my first opportunity came to examine the automobiles that were designed and constructed for the Imperial Japanese Army to be used in this American invasion I could not understand why the road wheels were made of three separate units with a steel-tired unit in the middle, flanked by rubber (biscuit) tire units on each side. I soon found, however, that the large diameter wheels were of exceeding value, especially when the going was bad and the wheels sank for 24 inches into the roadbed, but imagine my surprise when upon striking a railroad to see the solid tired center wheels treading on the steel rails, and the biscuit-tired flanking units keeping the wheels on the track so



GREAT POWER FITTED WITH SPECIAL DESIGN ROAD WHEELS, BUILT TO ACCOMMODATE 40 MEN AND A MACHINE GUN, REQUIRES DURING AN INVASION



DEPICTING AN AMMUNITION WAGON TRAILING A FIELD PIECE, SHOWING THE BODY OF SUBSTANTIAL WOOD APPLIED WHICH WOULD RETARD

that we ran along for miles and miles without even having to steer the automobiles. It was a great victory for the Imperial Japanese Army, and some recognition will surely come to his Majesty's engineers, who, by their ingenuity and initiative, have solved the problem of army transportation.

In America things are quite different. The general staff, so I am told, is waiting for the automobile builders of America on a "show me" basis. They have a saying in one of the American States, "Missouri" I think they call it, and all the citizens when they are confronted by something they do not understand, throw out their chests, look wise, and say, "I am from Missouri—show me." This State lies too far to the East to interest his Imperial Majesty overmuch, and we may never have the occasion to go there for the purpose of making good on the "show me" plan.

Our idea is to throw a line across to the east of the Great Divide and hold our position until the forces now gathering in California can take the Pacific Coast defences and subdue the entire West from the Rocky Mountains eastward to the position that we now have within our grasp. Our equipment comprises 200 automobiles in ten squadrons, and I am with the advance guard comprising one squadron made up of ten automobiles carrying 400 men and one machine gun; two automobiles carrying field piece ammunition, trailing one gun each. The balance of the automobiles, making 20 to the squadron, carry ammunition, hospital supplies, gasoline in briquette form, and rice, this being the most concentrated food per pound, requiring very little else as sustenance for the men. The trailing field pieces are fitted with the same kind of wheels as those of the automobiles, and this method of transporting them is in my judgment far superior to the French idea of placing the guns on automobiles to make headway with them in that manner.

I can see how it would be extremely difficult for an automobile brigade of the proportions of this expedition to take and hold such a long line, defending it against a well-equipped army, but our forces in California are sufficient to protect our rear and maintain our line of communication; moreover, the American army is equipped with animal transportation, excepting for a very limited supply of American touring cars and a few automobile trucks, with small diameter wheels, designed for relatively high speed, that were purchased in France by the Bureau of Insular Affairs for use in the Philippines.

I cannot understand how the makers of trucks in France would be able to appreciate the American requirement as it should be understood by the army, because French roads are notoriously good, and the fact that the trucks would do service in France is no sign that they would be of any great value under the conditions that we are operating. Remembering that these trucks are intended for service in the Philippines, however, I would not bore you with a reference to them, more than to show that American officials, instead of developing their home industries along lines suitable for their need, rely upon Paris, presumably because the French capital is the seat of fashion.

There is a certain inconsistency attached to the American method of proceeding. When that honorable government wants battleships it has a department that makes drawings and specifications of its requirement, and it spends millions of dollars for the purpose of helping the shipbuilders in America to give them the kind of battleships that would seem to be fitting for the occasion, but when it comes to army transportation the honorable Congress refuses to spend a "red cent" and the army is left to do as best it can, and this no doubt is the reason why the "army mule" continues to be so assiduously courted.

Prominent Features of the Japanese Army Automobiles Indicating Acumen of the Designers and How Keen Observation Coupled with Enterprise Brings Results

I am forwarding to you photographs of the advance guard automobiles as they were taken just before we entered Socorro, thus affording you an opportunity to judge of the nature of the country which we have traversed, and in view of the fact that the construction of these automobiles was held as a secret until the consummation of the great plan of invasion the honorable readers of the *Ji-Ji* will be much interested in the details of design of the automobiles, coming at a time when success is within our grasp. To begin with, it is not the idea of his Majesty's Imperial Army to hide from the enemy; the great question then was to so design the automobiles that they would carry the arms and ammunition, food, supplies, and hospital equipment, making sure that the very worst road could be traversed so that high speed on good roads was shunned as if it were the smallpox and the parts were made of great strength.

The limitations, considering the main plan, included the entire elimination of armorplate, or other protection against the gunfire of the enemy, and in order to be sure that the automobiles would traverse mud-holes and alkali bogs, the wheels were made 60 inches in diameter, as the Americans say, and the motors

CONSTRUCTION, WITH NO ATTEMPT AT ARMORING, IT BEING THE IDEA THAT THERE SHOULD BE NO IMPEDIMENTS THE PROGRESS OF THE CARS

were designed to deliver 100 horsepower at 800 revolutions per minute. The speed of the automobiles on the road was fixed at 4 miles per hour when the motor runs at 800 revolutions per minute, thus making it possible to concentrate 100 horsepower at the point of contact of the large diameter wheels with the road, with the transmission gear thrown into the direct position, which is third speed, leaving the fourth speed for traveling up to 10 miles per hour when the automobiles are using the railroad track, or other hard roadbed. The large diameter wheels being fitted with three units with biscuit-tires on the outside protect the steel tire on the middle member when the wheels are mounting obstructions, but the biscuits on the outer members compress just enough to bring the steel tire into road contact, thus saving the rubber tires from undue work, and affording the steel tread when railroad tracks are being traversed.

When the automobiles are going through mud, the wheels being 24 inches face, counting the three members, they do not sink as deep as might be suspected; moreover, the large amount of power of the motor available at the low speed of the transmission serves the intended purpose, facilitated by the paddle-like effect of the rubber biscuits on the flanking members of the three-wheel set. Under the very worst conditions these large diameter wheels sink 24 inches in "gumbo," but with the transmission thrown into low gear, thus reducing the speed of the automobile on the road to one mile per hour, this gumbo is negotiated without any difficulty, excepting, of course, that the speed of traveling is very low.

I failed to realize the necessity of having a rear axle with a section of 4 1-2 x 6 inches made of chrome nickel steel, and side chains for the final drive that seem big enough to tie up a battleship, but on the two or three occasions when the advance guard had to negotiate this gumbo I had an opportunity to observe that there is nothing like a sufficiency of reliable steel where it will do the most good. There is one detail in the design and construction of our army automobiles that served as a puzzle to me at first, for I could not see why the flanking rubber-tired members of the three-wheel system should be fastened to the middle steel tire member by means of springs instead of having all three of the members in rigid relation to the sprocket drum. I soon found, however, that in mounting the railroad tracks, and in traversing abrupt obstructions, it was a great advantage to have the outside wheel cease to rotate for a moment, accumulating power in the spring that serves as the connection between the two members, and after a certain amount of energy is stored in the spring connection the outer wheel assumes the office of tractor also, and under the impetus of the stored energy in the spring connection it boosts the automobile up onto the obstruction in a nimble fashion.

When our honorable engineers were spying in American automobile factories they were much impressed with the American machine tools, and the keenness of the designers of automobiles, but they foresaw that there was nothing being built for the American army, due to the fact that the authorities lie back and wait until they have their nose rubbed in the idea that impresses them as being the proper thing, whether they like it or not. It was agreed at the time that this was no fault of the engineers, nor could it be expected that the makers of automobiles in America would invest money in products for which there was no definite demand. It was different with our honorable engineers, and when they undertook the task of building the automobiles for the Imperial Japanese Army they did not have to consider as to whether or not there would be a demand, nor were they bound down to commercialisms from the rubber-tire point of view or other considerations that have to be taken into account in the ordinary course.

For the life of me I cannot understand how the American Congress consents so readily to paying $400 a ton for armor-plate for batteships, and balks so abruptly when it comes to

Map of the frontier of Mexico between that country and Arizona and New Mexico, showing how the invasion of the United States would be a possibility with the connivance of Mexico and through the use of suitable automobiles

the design, construction and payment for the character of automobiles that obviously must replace animal transportation if the American Republic hopes to maintain its position in the line of nations. As an economist I would agree that the automobiles such as we are using would cost too much for a merchant in New York or elsewhere to use in the delivery of goods, primarily on account of the large diameter wheels and the considerable cost of rubber for the tires, and, too, it would be an unnecessary cost, due to the fact that smaller diameter wheels serve very well indeed on paved streets.

There is another idea that prevents the Americans from bestowing upon themselves the reward that should be their just due, and that is the speed mania. I understand that American pleasure automobiles are designed for extremely high speed work, and the merchants in the great cities of the Republic buy these high-powered pleasure automobiles and use them when they are on tours of recreation, and, not knowing any better, they demand high speed in their freight automobiles, so that they can deliver goods, let it be said, a spool of thread to a lady in the suburbs at a speed of 30 miles per hour. I am not sure, but I have a theory which has for its foundation the probability that army officers use these high speed touring cars when they are on a peace footing, and while they are willing to admit that an army must crawl on its belly if it uses animal transportation, they do not seem to understand that its crawling days will be over the very minute that some of the money that goes for armorplate at $400 per ton is put into automobiles.

Australian Advices

Good Repairmen Scarce in the Antipodes — American Globe Trotters Stimulate Trade—Competition Keen for American Cars

SYDNEY, N. S. W., Feb. 4—The greatest drawback to the trade in Australia and New Zealand is the great scarcity of skilled repairmen, and it is owing chiefly to this fact that the country is so far behind in motor cars. There is an abundance of second-hand cars for sale and some garages are brimful of used cars that are often quite unsalable, as their condition is uncertain, and it is something out of the ordinary to see a car of four or five years of age in a good going condition, chiefly owing to the fact of the dearth of good workmen. The Immigration Department is bringing out men of all trades, but very seldom does a good all-around repairman come out.

Many a time has a big garage been without a suitable foreman for months. The same conditions apply to the body building trade, which is growing to a great extent, owing to the heavy import duty imposed upon all coach work. The wages paid to workmen in this country are somewhat lower than the rate paid in the United States, but, on the other hand, the cost of living is considerably cheaper and owing to the milder climate there is plenty of work all the year round.

A repair foreman gets about five pounds per week, and ordinary skilled men get from £3 to £3 10s. Wages in Australia are now controlled by law and the Arbitration Court's award is 1s. 4d. (32 cents) per hour of 48 hours per week, and overtime is paid by one-quarter rate extra. Now that the American car is gaining the confidence of the people there is an opportunity for parts and accessories manufacturers to get a market.

The principal accessories here of American make are chiefly Jones and Stewart speedometers, Dietz and Rushmore lamps, Klaxonet horns and Vacuum oils. Such parts as magnetos and other ignition supplies; tires, both pneumatic and solid; chains, for pleasure and commercial vehicles; all kinds of tools, spanners, lifting jacks, etc., of American manufacture are almost unknown in this country.

Another line that is not represented is the brass-framed wind screen. Every wind screen made in this country is of the wooden frame type and in less than a season all the joints and adjusting appliances are worn and the whole screen rattles.

The wind screens that come fitted to American cars are admired by their users and when a local shield maker is asked to make one he says he cannot make one, as he has not the fittings, and in this line alone there is an opening for a good trade, even if it were for frames and brackets alone and let the local man fit in the glass.

The principal dealers in sundries and supplies are: Bennett & Wood, Ltd., and Auto Import Co., in Sydney; Canada Cycle & Motor Co., and Jas. Howard & Co., in Brisbane, Queensland; Herbert H. Smith, The Australian Motor Accessories Co., Ltd., and A. E. Kemsley Propy., Ltd., in Melbourne, Vic.; Jas. Hill & Sons, W. Cornell & Son, and G. N. Taylor & Co., Adelaide, So. Australia.

Most of the car importers have taken to building their own bodies and in addition to the garages there are outside firms doing a good body trade. The principal of these are: The Melbourne Motor Body Co., Melbourne; Duncan and Fraser, and F. T. Hack Motor Body Works, Adelaide; Steembohms, Ltd., E. E. Agate and A. H. Sweeney, Sydney.

In marine motors the words "American made" are considered the hallmark of quality and design and a guarantee in themselves. The same applies to the sundries; there is no reason why the motor accessories should not command a market, and the only reason is lack of introduction.

The three round-the-world automobilists, J. R. Drake, T. M. Hanlon and T. O. Jones, who are doing a 40,000-mile journey in a 20-horsepower Hupmobile, arrived here by the steamer Moana on January 24. Up to the time of their arrival they have done over 5,200 miles by motor car and some 8,000 miles by sea.

Upon its arrival here the car looked none the worse for its hard drive across the United States, and should it continue to go along as well in this country, it will leave a good name for the Hupmobile.

Since American cars have established themselves every agent sought an American agency and in each instance the $1,000 car was preferred. The result is causing keen competition among the importers of American cars and later on the competition, it is predicted, will be far keener than it has ever been among the dealers in European automobiles. At the present time agents are selling their consignments soon after arrival.

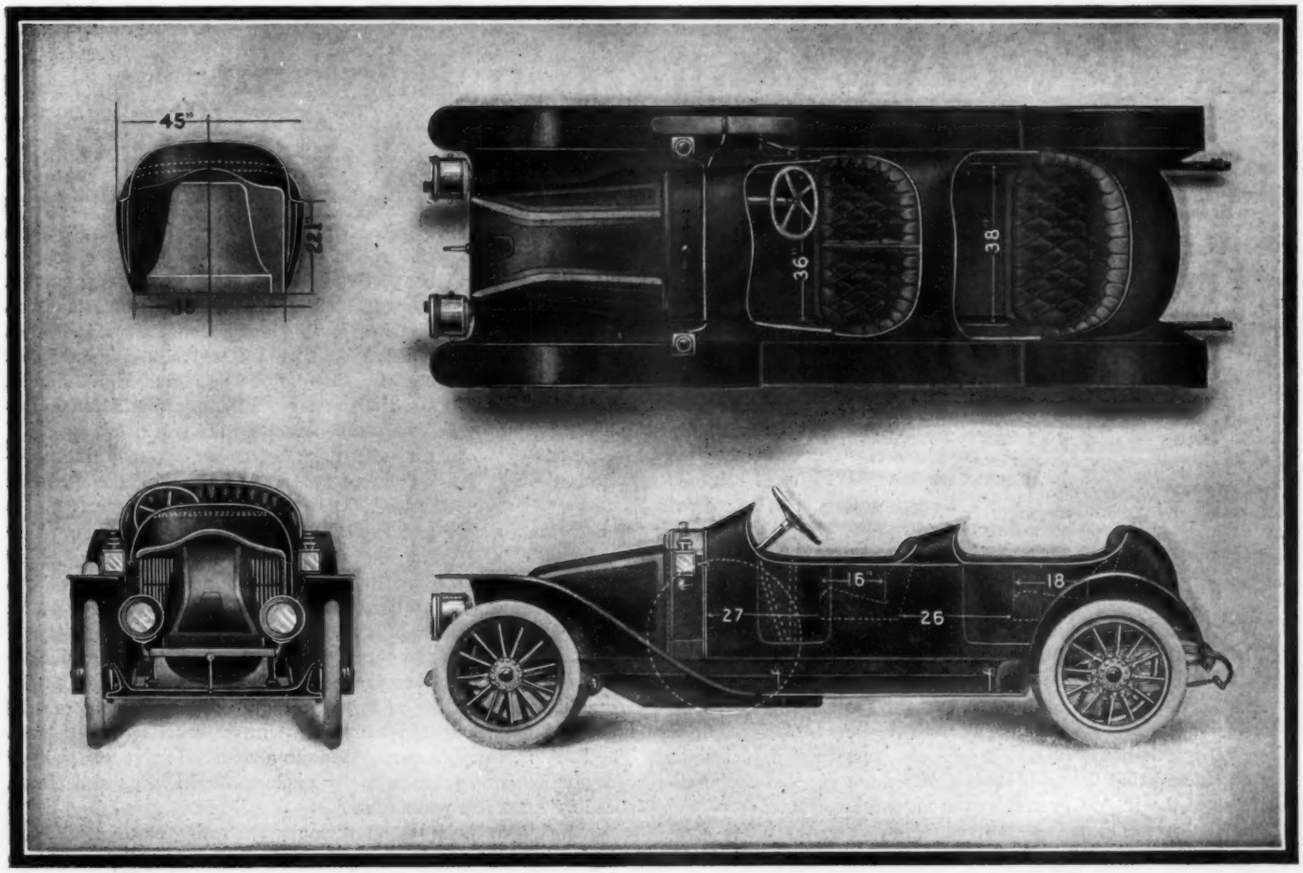
Latest Idea in Body Work

Presenting a New Design of Body That Is Being Made in France with Protection for the Rear Seat—By Geo. J. Mercer

AHEAD pressed for novelties, the French are making every effort to improvise innovations—it is their way of advertising. Betimes, as the fates ordain, some of these ideas are worthy of reproduction, and of them it is believed that the body here reproduced is entitled to the distinction of notice on the part of the American makers of bodies, nor is it too much to expect that the automobile makers will be interested in what seems to be an improvement of the tonneau. Referring to the illustration, it will be observed that the body is of the fore-door type, and the dash is provided with an overhanging cowl that reaches back almost to the steering post. This form of protection, including the "dodger" facility (deflecting the air-current above the heads of the occupants of the front seats) is realized without interfering with the entrance which is of the usual width.

The innovation, as will be seen, lies in the duplication of the cowl as it obtains at the dash, back of the front seat for the protection of the occupants of the tonneau. The cowl at the rear terminates at the sill of the door, but the door, while it is the cover of a wide entrance, is set back as far as possible, bringing the cushion of the rear seat, in part, out into the opening of the door. Just how this is brought about is shown by white dotted lines. In the proportioning of the body it is shown that the chassis members are 36 inches from out to out, and the flare of the body at the doors is 45 inches from out to out. Within the body the rear seat is 38 inches across, and the tapering of the body toward the front brings the width of the front seats down to 36 inches, which is ample, in view of the fact that the driver prefers not to have too much room.

In this example the steering wheel is placed on the right-hand side, and the spare tire is located on the running-board in juxtaposition to the entrance. The rear of the body is curved away in the shape that will prevent dust from climbing up behind and alighting on the person of the occupants of the rear seats. The doors are 22 1-2 inches high, and since the body is stopped off at this level, the effect is of the straight-line tendency. The sweeping sides and smooth exterior save the body from looking formidable. The wheelbase is long, and foot room both in front and in the tonneau is characteristic of this effort. The framing is of wood, but aluminum with a highly finished exterior and luxurious upholstery complete the undertaking.



PLAN, SIDE ELEVATION AND FRONT ELEVATION OF A NEW FRENCH BODY, SHOWING AN OVERHANGING COWL BACK OF THE FRONT SEAT FOR THE PROTECTION OF THE OCCUPANTS OF THE TONNEAU

Experiment to Show Back Pressure

Back Pressure Due to a Choking Muffler Makes the Motor Lazy and Detracts from the Power Obtained

SUPERSTITION seems to wield a considerable influence in the direction of inducing automobilists to believe that a muffler cut-out will make up for the choking effect of an inferior muffler, but they fail to take into account the fact that all they ultimately use the muffler cut-out for is to make noise and that in going up a steep grade they are so busy wondering whether or not the brakes will hold that they forget to press on the muffler pedal and the motor chokes to death half way up the hill. This is a great misfortune, since if the motor continues to do its part there are no brakes required in traversing an upgrade. Instead of worrying about the brakes, it will be more to the point to find out if the muffler is a good one and keep the motor from stalling on a hill. If the automobilist will bring himself to a realization of the fact that it is useless to put mixture into the motor if the muffler keeps the products of combustion from leaving it will then be possible to study the characteristics of mufflers, remembering:

(a) That the muffling of the sound of the exhaust is at the cost of some power with mufflers in general;

(b) That some motors are fitted with mufflers that are entirely too small, and the only reason why they are noiseless is because the mufflers choke the exhaust, reducing the power of the motor very materially as well as reducing the noise.

As an indication of the practical situation under relatively poor conditions, the tabulation here given is offered as proof and a study of these data discloses the fact that the brake horsepower failed to increase in anything like direct proportion to speed, but the back pressure from the muffler increased from 0.86 to 6.25 pounds per square inch between 500 and 1,500 revolutions per minute of the motor.

R. P. M.	Brake Load Lbs.	H.P.	Manometer Inches	Back Pressure In Lbs.
500	45	13	1 3-4	.86
600	39	13	2 3-4	1.35
700	25	14	3 3-4	1.84
800	45	20.5	4 1-4	2.08
900	55	28.3	5	2.45
1000	50	28.6	6 3-4	3.3
1100	45	28.3	10	4.9
1200	45	30.8	10 3-4	5.26
1300	45	33.4	11 1-2	5.75
1400	40	32	12	5.88
1500	35	30	12 3-4	6.25

The mean effective pressure developed in the engine cylinders was, at 1,200 R.P.M., 45 pounds per square inch.

$$\frac{Plan}{33{,}000} = HP \qquad P = \frac{HP \times 33{,}000}{lan}$$

$l = .458$ ft.

$a = 14.2$ sq. in.

$n = 600$.

HP per cylinder $32/6 = 5.33$.

$$\frac{5.33 \times 33{,}000}{.458 \times 14.2 \times 600} = 45 \text{ pounds per square inch M.E.P.}$$

Back pressure at $1{,}200 = 5.26$ above atmosphere. Therefore, with the muffler off and motor exhausting into atmosphere, the M.E.P. should be $45 + 5.26 = 50.26$ pounds per square inch.

$$HP = \frac{50.26 \times .458 \times 14.2 \times 600}{33{,}000} = 36.$$

Thus the muffler is causing a loss of 4 HP at 1,200 R.P.M.

Rating Gasoline Motors in England;* Proposed Alteration of R. A.C. Formula

REPORT of the Horsepower Formula Committee of the Incorporated Institution of Automobile Engineers, consisting of Mr. Dugald Clerk, F.R.S., M. Inst. C. E. (Chairman); Messrs. A. Craig, J. S. Critchley, C. R. Garrard, L. H. Hounsfield, Max R. Lawrence, L. H. Pomeroy and D. J. Smith, representing the Institution of Automobile Engineers; Col. H. C. L. Holden, Capt. R. K. Bagnall Wild, Prof. Callender, Dr. W. Watson, Messrs. W. Worby Beaumont, E. Russell Clarke and Mervyn O'Gorman, representing the Royal Automobile Club, and Mr. G. A. Burls, M. Inst. C. E., representing the Society of Motor Manufacturers and Traders.

The report of the Rating Committee of the Institute was read and discussed at a meeting held on November 10, 1908. It dealt with proposals put forward on behalf of the Society of Motor Manufacturers and Traders by Mr. G. A. Burls, M. Inst. C. E. The Rating Committee agreed with the proposals in principle, but considered that the tests submitted did not support the modifications of the R. A. C. rating required by the formulæ.

The report recommended the formation of a committee composed of members of the Institution, members of the R. A. C., and representatives of the Society of Motor Manufacturers and Traders. This committee was called "The Horse-Power Formula Committee." Several meetings were held, and a scheme was agreed upon, Mr. G. A. Burls, M. Inst. C. E., being good enough to undertake the collection of the necessary material from the leading automobile firms in this country and abroad; he has now prepared the tables of particulars which accompany this report, and made the many calculations and deductions shown. Mr. Burls' letter to the chairman of the committee accompanies the report, and it describes the nature of his work.

At meetings held on June 30 and October 13, 1909, the committee resolved to recommend for consideration the formula

$$K\,d\,(ad + s)\,N,$$

as a formula giving a rating with a stroke-bore correction. The constants K and a were purposely left without any specified value to enable the committee ultimately to arrive at values from experiment and observation. In this formula d is the bore, and s the stroke, in inches; N is the number of cylinders.

Before arriving at the above formula the committee considered the two main corrections proposed to be applied to the R. A. C. formula, viz., variation of mean pressure with dimensions of cylinder and variation of piston speed with ratio of stroke to bore. The R. A. C. formula corresponds to a mean effective pressure of 67.2 pounds per square inch per explosion, with a normal piston speed of 1,000 feet per minute.

According to the R. A. C. formula, the rating $= 0.4\ D^2 \times N$.

This simple formula, notwithstanding frequent statements to the contrary, involves both specified mean pressure and piston speed. It assumed, however, that piston speeds did not vary materially from 1,000 feet per minute.

*The Automotor Journal, February 11, 1911.

Examination of the accompanying tables of results proves conclusively that piston speed does increase with the stroke-bore ratio.

Stroke-Bore Ratio

The tables give some particulars from tests made of 144 engines, but only 101 tests contain all the data required for comparing the effect of stroke-bore ratio on piston speed for values of r from 1 to 1.61, and they do not necessarily represent the maximum brake horsepower which can be obtained. The following table shows broadly the increase of piston speed with stroke-bore ratio. Five groups have been taken with a variation in each of 0.1 in stroke-bore ratio as nearly as could be obtained.

Change of Piston Speed with variation of Stroke-bore Ratio $r = s/d$

Number of Tests	Stroke-bore Ratio	Highest recorded B.H.P. Piston Speed at Max. B.H.P.
15	1.00 to 1.08	1303 ft. per min.
30	1.10 to 1.20	1240 " "
24	1.21 to 1.30	1385 " "
25	1.33 to 1.44	1414 " "
7	1.50 to 1.61	1597 " "

101 engine tests.

Each value of piston speed is the mean of the values obtained in the number of tests given; to some extent, the taking of average results masks the variation between the different engines. Accordingly, Fig. 1 has been prepared, in which piston speeds are plotted against stroke-bore ratios for the 101 engines.

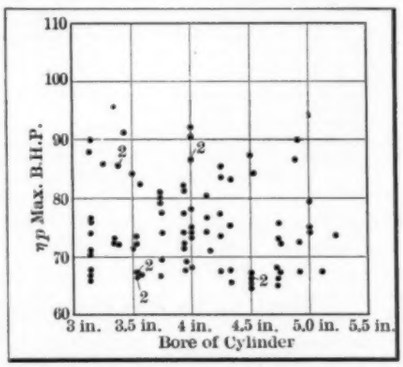


Fig. 3—Mean effective pressure corresponding to B. H. P. plotted against cylinder bore

The results plotted in Fig. 1 show an undoubted increase of piston speed with stroke-bore ratio, but the results obtained are exceedingly irregular. For example, between $r = 1$ and $r = 1.1$ the maximum piston speed in three cases lies between 1,600 and 1,700 feet per minute, but the very large number of tests show 1,400 down to about 1,000 feet per minute. Between $r = 1.1$ and $r = 1.2$ the maximum values appear to be 1,400 and 1,500 feet per minute in two separate tests, but the greater number lie below 1,300 feet per minute. Between $r = 1.2$ and $r = 1.3$ the maximum values are above 1,600 feet per minute, but the greater number lie below 1,400 feet per minute.

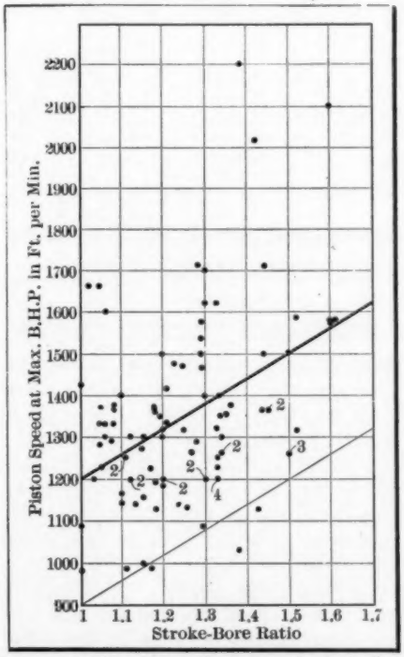


Fig. 1—Piston speed plotted against stroke-bore ratio at maximum B. H. P.

The highest value of all is found between $r = 1.3$ and $r = 1.4$, namely, 2,200 feet per minute, but it is understood that this figure is open to doubt. In the same way between $r = 1.4$ and $r = 1.5$ the highest value is just over 2,000 feet per minute, and the highest value at 1.6 is 2,100 feet per minute. From this it will be seen that it is impossible to formulate accurately any law of variation between stroke-bore ratio and piston speed. Notwithstanding this, if 1,200 feet per minute be taken as the speed to be expected with $r = 1$, and 2,100 feet per minute that corresponding to $r = 2.5$, then, assuming a linear law between the two points, the piston speeds found for different stroke-bore ratios are such as can be obtained (bench test) at maximum brake horsepower from a carefully designed engine. These piston speeds, it will be evident, are higher than those given by about 50 per cent. of the engines examined. About 50 per cent. however, give greater values, so that for a maximum rating no hardship would be occasioned by assuming the law to be that given by the black line shown upon Fig. 1. Any formula required to express B. H. P. on this basis must assume a piston speed of 1,200 feet per minute for $r = 1$ and 2,100 feet per minute for $r = 2.5$.

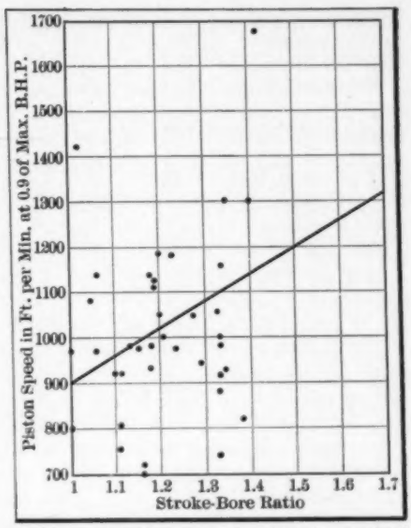


Fig. 2—Piston speed plotted against stroke-bore ratio at about 0.9 maximum B. H. P.

Fifty of the engines, Nos. 1 to 50, of those tested were tested at approximately 0.9 of the highest brake horsepower recorded, and in all cases the tests show lower piston speed. These results have been plotted in Fig. 2.

Here also the stroke-bore ratio increase is accompanied by increase in piston speed, but the piston speed for $r = 1$ may reasonably be taken at 900 feet per minute and for $r = 2.5$ at 1,800 feet per minute.

Mean Effective Pressure Corresponding to the Brake Horsepower

This value has been called ηp in the previous reports. The results of the various tests have been tabulated and plotted against cylinder bore, but no increase can be deduced in this way as due to increasing cylinder bore. When, however, only one make of engine is taken the case is different, and the rise of ηp with d is apparent.

Fig. 3 shows 88 tests in which ηp at maximum brake horsepower is plotted against cylinder diameter. The values considered are those given by tests from 124 engines. Out of these, 88 give mean effective pressures of 65 pounds per square inch and above. The pressures rise as high as 95 1-2 pounds. Expressed in percentages, approximately 5.6 per cent. of the 124 engines give values above 90 pounds; 15.3 per cent. between 80 and 90 pounds; 28.2 per cent. between 70 and 80 pounds; and 21.2 per cent. between 65 and 70 pounds. About 50 per cent. of the engines thus show mean pressures above 70 pounds. The highest pressure was obtained in a cylinder of 3.35 inches diameter.

Fig. 3 supplies no evidence of increase of mean pressure with bore. Some makers obviously succeed in getting very high mean pressures from quite small cylinders while others do not realize such satisfactory results.

It is interesting now to consider the highest values of ηp given in these tests by cylinders of different diameters. Compare the two highest obtained at the highest brake horsepower recorded with cylinders of about 3 inches, 4 inches and 5 inches respectively as follows:

Test No.	$d =$	ηp			
122	3.15 in.	90.5	lbs. per sq. in.		
83	3.13 in.	88	"	"	
					Mean 89.2 lbs. per sq. in.
45	4.0 in.	92.3	"	"	
88	4.0 in.	90.2	"	"	
					Mean 91.2 lbs. per sq. in.
72	5.0 in.	94.6	"	"	
116	4.88 in.	90.3	"	"	
					Mean 92.4 lbs. per sq. in.

Here an increase is shown of nearly 4 per cent. The value of ηp for about 3 inches diameter is 89 pounds per square inch, and for 5 inches diameter 92.5 pounds per square inch.

Tests by Messrs. White and Poppe, cited by Mr. Burls, show a large increase—over 25 per cent.; 3.15 inches diameter giving ηp = 80.6 pounds per square inch, and 5 inches diameter ηp = 102 pounds per square inch. See Fig. 4.

The experience of many makers also proves that in testing under similar conditions increase of cylinder dimensions increases ηp. In discussion many members of the committee give this increase as part of their ordinary experience.

It is known also that in closed cylinder experiments the cooling loss in a given time is greater in a small vessel than in a large one; further, that in gas engine practice higher mean pressures are obtained under similar conditions of compression in large cylinders than in small ones; also that the mechanical efficiency of a large engine is usually greater than that of a small one.

TABLE OF PROPOSED RATINGS BY FORMULA

Max. B. H. P. rating per cylinder = 0.464 $(d + s)$ $(d - 1.18)$. See Fig. 7.

r =	d = ins.	s = ins.	Rating per cyl.	r =	d = ins.	s = ins.	Rating per cyl.
	2½	1⅞	2.6		2½	3¾	3.7
0.75	3	2¼	4.3		3	4½	6.1
	4	3	8.9	1.5	3½	5¼	9.1
	5	3¾	15.0		4	6	12.7
					4½	6¾	16.8
	2½	2½	3.0		5	7½	21.4
	3	3	4.9				
1.0	3½	3½	7.3		2½	5	4.5
	4	4	10.2	2.0	3	6	7.4
	4½	4½	13.5		4	8	15.2
	5	5	17.2		5	10	25.8
	2½	3⅛	3.3		2½	6¼	5.2
	3	3¾	5.5	2.5	3	7½	8.6
1.25	3½	4⅜	8.2		4	10	17.8
	4	5	11.4		5	12½	29.6
	4½	5⅝	15.1				
	5	6¼	19.3				

Taking into consideration all these matters and the results of many tests of petrol engines for cars, the committee is of opinion that it is necessary to allow for an increase of the value

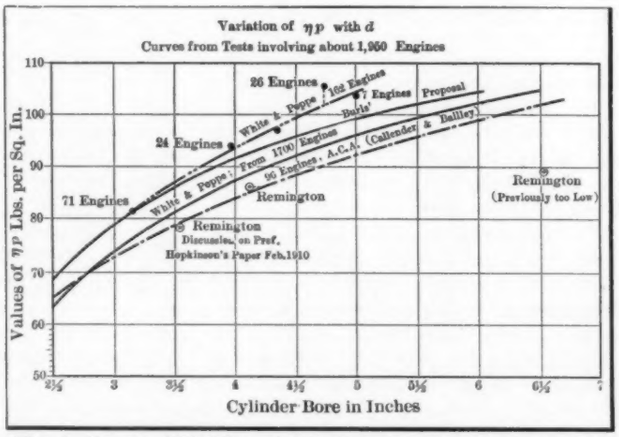


Fig. 4—Curves plotted from tests on various motors showing the difference between the mean effective pressure with the alteration of bores

of ηp with the cylinder diameter, and they accept 68 1-2 pounds per square inch for ηp when d = 2 1-2 inches and 99 1-2 when d = 5 inches. The best current practice as to ηp is therefore taken as—

$\eta p = 130\ (1 - 1.18/d)$ pounds per square inch . . . (a)

See Fig. 5.

After consideration of the evidence contained in the data of 143 petrol engines, collected by Mr. G. A. Burls, M. Inst. C. E., the committee is of opinion that the rate of increase of maximum practicable piston speed with stroke-bore ratio can be adequately represented by the equation:

$a = 600\ (r + 1)$ feet per minute . . . . (b)

where r is the ratio of stroke to bore. This implies a maximum practicable piston speed of 1,200 ft. per minute for r = 1, rising to 2,100 ft. per minute for r = 2.5. See Fig. 6.

Proposed Formula

The committee therefore proposes a formula which includes an increase of ηp with cylinder diameter and increase of piston speed with stroke-bore ratio. It is:

Max. B.H.P. rating per cylinder = 0.464 $(d + s)$ $(d - 1.18)$.

This formula may be considered to give the maximum practicable B.H.P. as determined by a bench test under onerous but

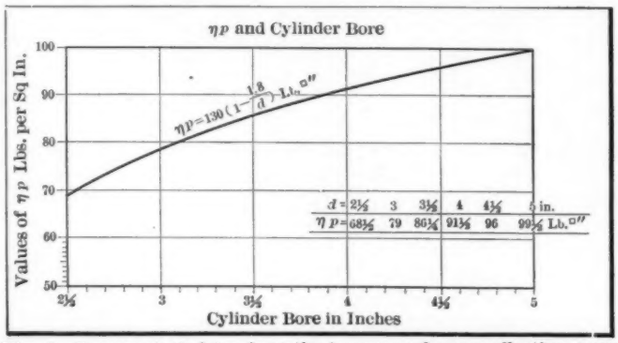


Fig. 5—Curves plotted to show the increase of mean effective pressure for different dimensions of bore of cylinders

still safe conditions for carefully designed and soundly constructed engines of from 2 1-2 inches to 5 inches cylinder diameter and stroke-bore ratio up to 2.5.

Note as to the Proposed Equation

The exact formula for horsepower in terms of bore, d, and piston speed, a, is:

B.H.P. per cyl. = $1/168000\ d^2\ \eta p\ \sigma$ . . . .

where d is in inches; ηp in pounds per square inch; and σ in feet per minute.

In this equation substitute for ηp and σ the expressions (a) and (b) above, the equation becomes:

B.H.P. per cyl. = 0.464 d $(d - 1.18)$ $(r + 1)$.

For purposes of computation the following equivalent form is better:

B.H.P. per cyl. = 0.464 $(d + s)$ $(d - 1.18)$.

To simplify calculations, we recommend that the constant in the formula be taken as 0.45 instead of 0.464, that is the B.H.P. for an engine with N cylinders = 0.45 $(d + s)$ $(d - 1.18)$ N where d and s are in inches. The form of the formula if d and s are in mm. will be added later.

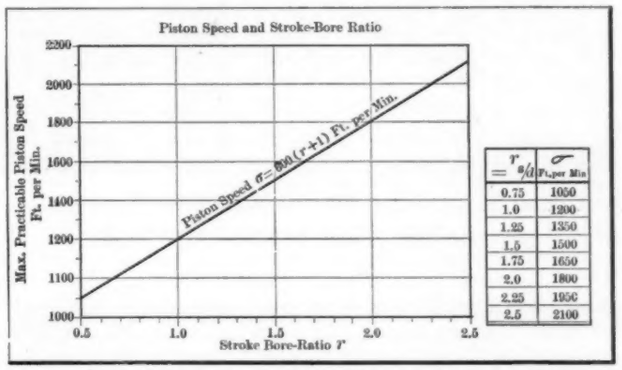
How Acid Vulcanizers Are Made

French Technicians Give Information About the Making of Acid Vulcanizers

TIRE repairing probably occupies the attention of the average automobilist more than any other subject, and among those who have failed to take the necessary precautions are quite a number who look upon a vulcanizing equipment as too formidable for them. A little experience would enable the average automobilist to revise himself on the subject of a vulcanizing equipment; he would find after a trial or two that it is a very simple operation to manipulate a vulcanizer, but he cannot be sure that the fabric and the rubber of the tire will be conserved if unknown chemicals are promiscuously applied. It is foolish to admit that oil and even light will damage rubber, and not admit that there is danger in applying chemicals to the same without having knowledge of the makeup of the chemicals and

of the action that will take place when the chemical compound is brought into contact with the rubber. The latest advices from abroad in relation to "cold vulcanizing" would seem to indicate that there are two processes in common use, one of which involves the use of such liquids as sulphate of camphor, and another of these chemical compounds is composed of bi-sulphate of carbon and protochloride of sulphur.

In using sulphate of camphor for vulcanizing purposes, the parts that are to be stuck together are first cleaned and then rasped, and after from three to four applications of the rubber solution, making sure that each coat of solution dries before the next is applied, the vapor of sulphate of camphor is allowed to contact with the last coating of rubber just before it is quite dry. This operation must be performed quickly and deftly, otherwise the effect will be lost. The patch must be pressed against



r = S/D	σ Ft. per Min
0.75	1050
1.0	1200
1.25	1350
1.5	1500
1.75	1650
2.0	1800
2.25	1950
2.5	2100

Fig. 6—Curve plotted to show the practicable maximum piston speed in feet per minute in relation to the ratio of bore and stroke

the inner tube with considerable force, and held in this relation for a period of twenty minutes or more.

In the use of the bi-sulphate of carbon and protochloride of sulphur the first thing to do is to make a solution holding:

Bi-sulphate of carbon, 98 per cent., by weight.

Protochloride of sulphur, 2 per cent., by weight.

After these constituents are mixed, which, by the way, might best be done by a chemist, the vulcanizing operation may be performed by first cleaning and rasping the parts that are to be stuck together, and then solutionizing the surfaces with rubber compound, much as in the preceding case, applying the bi-sulphate of carbon solution just before the last application of rubber compound is dry; in other words, when it is tacky. Pressure must be applied to the parts to maintain them in the close relation until the vulcanizing process is complete.

The information at hand does not tell whether or not these chemicals are detrimental to the rubber or the fabric, and those who may have had experience with this process are offered the opportunity of relating the incidents thereof in the columns of THE AUTOMOBILE.

Heat Value of Mixtures

Stating the Relations of the Components of Fuel Mixtures and How the Heat Values May Be Determined.

WHEN a mixture is burned the heat given off depends upon the heat units contained in the substances of the same. If some of the substances have no heat value they will drag down the constituents that do hold heat. In a given mixture the heat value may be found if the heat value of the substances is known. Let the percentages of the substances be designated as P1, P2, P3, P4, P5, P6, and the H1, H2, H3, H4, H5, H6, *** represent the heat values of the constituents, when the formula:

$$Hm = P_1H_1 + P_2H_2 + P_3H_3 + P_4H_4 + \text{etc.},$$

When,

Hm = maximum heat value of the combined constituents of the mixture.

Knowing the properties of the constituents of the fuel, taking advantage of the formula, makes it a simple task to solve for the maximum heat value. Properties of the substances are quite accurately established. They are given on the following page.

Glancing at the table discloses several things that are well worth considering. Take hydrogen, for illustration; it has a heat value of 62,000 British thermal units of heat. Compare this value with the heat value of carbon. The latter has a heat value, according to the table, of 14,600 British thermal units of heat. Subtracting the heat value of carbon from the same value of hydrogen, the result is that 47,400 more British thermal units of heat are lost with a pound of hydrogen than will be lost with a pound of carbon. This fact should lead to the conclusion that hydrogen is a very valuable constituent of fuel. In the purchase of fuel, under the circumstances, it is far from wise to call for it by the gallon—that is, if there is any choice. It would be more to the point to get a doctor's prescription! Let the doctor put up a prescription for:

Hydrogen	16 pounds
Carbon	84 "
Oxygen	zero
Water	zero
Total	100 pounds

The reason why it will not be desirable to purchase oxygen with the fuel is because it is available in the atmosphere at no cost at all. Water is in the same category; moreover, this liquid has no heat value, nor is it available, like oxygen, to burn the fuel. The time may come when water will be used in internal combustion motors for the purpose of leveling the heat wave in the process of making a "soft" performing motor. It is known that a little water, if it is injected into the cylinder at the proper instant, has a tendency to absorb some of the heat, and if it can be shown that this reabsorption process is attended by a positive advantage it will be time enough to use the water. But why purchase it at the price of hydrogen?

Automobile Engineers Should Be Able to Solve This Important Question

Confining the subject to the two most important constituents of automobile fuel, as carbon and hydrogen, why should it be looked upon as good practice to accept any grade of the fuel offered at the market price without considering the relation of the carbon to the hydrogen or the percentage present of each of these sub-

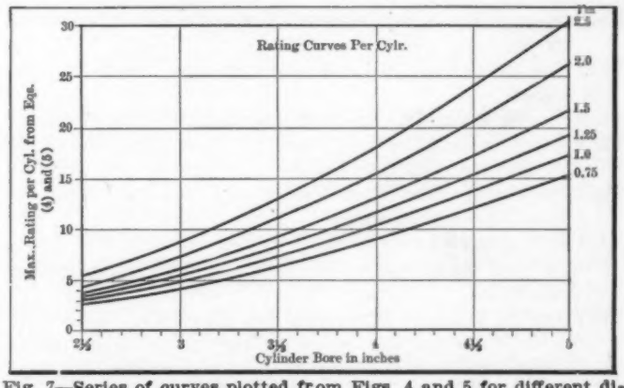


Fig. 7—Series of curves plotted from Figs. 4 and 5 for different dimensions of cylinder bore

stances? Just to show that there is quite a difference when the several hydrocarbons are compared, the table, as follows, is offered:

TABULATION OF HYDRO-CARBONS, SHOWING THE PROPORTIONS OF CARBON AND HYDROGEN PRESENT

Popular Names of Liquids	Hydrogen by weight	Carbon by weight
Gasoline	16	84
Benzine	8	92
Kerosene	15	85
Tar benzol	8	92
*Grain Alcohol	8	32

*Alcohol, in addition to carbon and hydrogen, holds 50 per cent of oxygen.

PROPERTIES OF SUBSTANCES THAT HAVE A HEAT VALUE, INCLUDING THE CONSTITUENTS OF ATMOSPHERIC AIR WHICH FURNISHES THE OXYGEN OF COMBUSTION

Fuel.	Chemical Proportions.	Weight of Gas at 30°, per Cubic Foot Pound.	Volume of 1 Pound of Gas at Atmospheric Pressure. Cubic Feet		Volume Required to Burn 1 Cubic Foot of Gas Cubic Feet		Weight Required to Burn 1 Pound of Gas Pounds		Specific Heat of Gas at Constant Pressure.	Heat of Combustion	
			32°	62°	O	Air	O	Air		B.T.U. per Pound of Fuel	B.T.U. per Cubic Foot of Gas at 62°
Oxygen, O	23 lb.O + 77 lb.N = 100 lb. air	.08927	11.20	11.88	...	.....	....	.....	.21751	.....	.....
Nitrogen, N	21 vol.O + 79 vol.N = 100 vol. air	.07847	12.77	13.55	...	.....	....	.....	.24380	.....	.....
Hydrogen, H	$2H + O = H_2O$	.00562	178.80	189.80	.5	2.38	8.00	34.80	3.40900	62,000	327
Carbon, C	$C + O = CO$	.....	.....	.....	...	.....	....	.....	.....	4,400	.....
Carbon, C	$C + 2O = CO_2$	.....	.....	.....	...	.....	....	.....	.....	14,600	.....
Carbon monoxide, CO	$CO + O = CO_2$	.07704	12.77	13.55	.5	2.38	.57	2.48	.24790	4,385	324
Carbon dioxide, CO_2	1 lb.C + 2.66 lb.O = 3.66 lb.CO_2	.12323	8.12	8.60	...	.....	....	.....	.21700	.....	.....
Methane (marsh gas), CH_4	$CH_4 + 4O = 2H_2O + CO_2$	.04538	22.37	23.73	2.0	9.52	4.00	17.40	.59290	23,976	1,010
Ethylene (olefiant gas), C_2H_4	$C_2H_4 + 6O = 2H_2O + 2CO_2$	.07830	12.77	13.55	3.0	14.28	3.43	14.90	.40400	21,476	1,585
Ethane, C_2H_6	$C_2H_6 + 7O = 3H_2O + 2CO_2$	.08369	11.94	12.67	3.5	16.66	....	.....	.....	22,356	1,765
Benzol vapors, C_6H_6	$C_6H_6 + 15O = 3H_2O + 6CO_2$	.22363	4.47	4.74	7.5	35.7	....	.....	.37540	18,183	3,836
Acetylene, C_2H_2	$C_2H_2 + 5O = H_2O + 2CO_2$	.07251	13.79	14.63	2.5	11.9	....	.....	.....	21,421	1,464

It Stands to Reason

That the Man Who Desires to Purchase a Good Automobile Has but Few Chances to Take, but Why Take Any of Them?

That Napoleon was premature when he sent a courier to announce the victory that he saw for him at Waterloo; destiny played him a trick.

That there is a defeat in every transaction for the man who toys with the ending of the play.

That it is the height of folly to slow up before the game is bagged.

That the hidden ditch is there; that cupidity is a poor guide, and that it is well to be on guard.

That a good idea cannot be exterminated by a mere say-so; it takes a better one to accomplish the feat.

That the whipped, if they resume hostilities in dead earnest, become the victorious.

That the sea ill-treats its battered hulks; that they float along as they are bravely manned.

That the wickedness of men portrays the wretchedness of society.

That disgust seizes upon the man who is about to be beaten.

That man's effort is eclipsed when he slows down and allows an antagonist to pass him by.

That the truth makes a mysterious impression on those who have trouble in picturing it.

That it is a rickety idea to listen to the florid description that is made of an automobile by a man who knows nothing about it.

That the ground-floor of success lies far below the dreamer who is always talking about what he is going to accomplish.

That the stealthy step of a cat is imitated by the person who has designs upon the welfare of his acquaintances.

That the inhabitants of the "land of villany" are not all at home.

That the chief lodger in a pig-sty will be found in the trough after his hunger is appeased.

That there may be two ways of accomplishing a given task, but that there is only one best way.

That some of the ways of accomplishing a task begin to sour while the milk is still fresh.

That reliable agents depend upon satisfied customers for their future grip on the trade.

That the bailiwick of the man who is bent upon acquiring money without delivering an equivalent is no place for those who have no time to lose in useless pursuits.

That capital is in the house of the conservative, and that it takes a conservative house-mover to change the location of the property.

That there is a difference between publicity and advertising; to tickle a pole-cat is to court publicity.

That the progressive are educated; and education is not to be had excepting from educational sources.

That the janitor thinks so little of the ragman that he loads him down with all the circulars that are sent to the building over which he presides as "Czar."

That the only man who reads is the one who subscribes for the paper that he thinks worth while.

That house-organs are delivered to a petrified list; the purchaser of the product of the company is fined accordingly.

That a defect in a plan cannot be eliminated by covering it up with complications.

That a large number of advertising campaigns are full of defects concealed by complication.

That most advertising is so designed as to please the man who dopes it out; it should be designed to please the man for whom it is intended.

That everybody takes a hack at what they know the least about; no man would burn his fingers if he knew it.

That quite a number of merchants advertise themselves and allow the advertising of their products to go to pot.

That a pound of tea is not improved just because it is given away with a piece of defective crockery.

That the bloom on the face of much of the advertising copy that is being printed is like the bloom on the cheek of a painted maiden; the bloom readily rubs off.

That in a large enterprise no individual can do it all; co-operation is the progressive idea; co-operation does not mean imposition.

That the most important department of a business should not be left to the tender mercies of a man whose sole interest lies in a commission on the value of the space that he can fill with words.

Removing Scale from Cylinders

The Most Unlooked-for Trouble in a Motor Is Due to the Growth of Scale on the Exterior Surface of the Combustion Chamber

CYLINDERS overheat if they are not properly cooled. As a rule, this trouble is due to the fact that the radiator is of insufficient capacity or to the further fact that the water pump is in poor condition, assuming that it is big enough for the work that it is placed to do. Quite a number of automobilists also understand that carbon formations within the combustion chamber are responsible for overheating. The point that does not receive attention, however, is that overheating will be the direct result of an accumulation on the exterior surfaces of the cylinders, and that this accumulation or scale, as it is usually called, is frequently produced under practical conditions.

One of the most potent causes of this growth is due to the using of dirty water in the radiator, and running on a retarded spark is at the bottom of the overheating that makes the water boil away when the motor is new. Once the scale is permitted to gain a footing on the surface it will grow rapidly and in a short while the unfortunate automobilist will have a cranky motor on his hands.

Fig. 1 shows a cylinder with the cover removed and the scale formation in sufficient presence to upset the good running qualities of the same. Fig. 2 shows the cylinders after the scale was removed. In the dislodging of the scale the process that was used included the use of washing soda in the water to make a saturated solution. In other words, a quantity of water was rendered soft by placing as much washing soda in it as it would dissolve and this soda solution was then run into the cooling system, through the filler of the radiator. When the system was supplied with as much of this solution as it would hold, the motor was started and by running on a retarded spark the solution was brought up to the boiling point, after which the motor was maintained under these conditions for fully an hour.

Shutting the motor down, the solution was then emptied out and the system was flushed out with hydrant water. Having thus removed the greater proportion of the scale, the system was again filled with soda solution and the motor was run on a retarded spark for another hour in order to remove the further evidences of heating trouble and for the purpose of cleaning the metal so thoroughly that the scale will have nothing to cling to, thus retarding the further formation of the same for the greatest possible length of time.

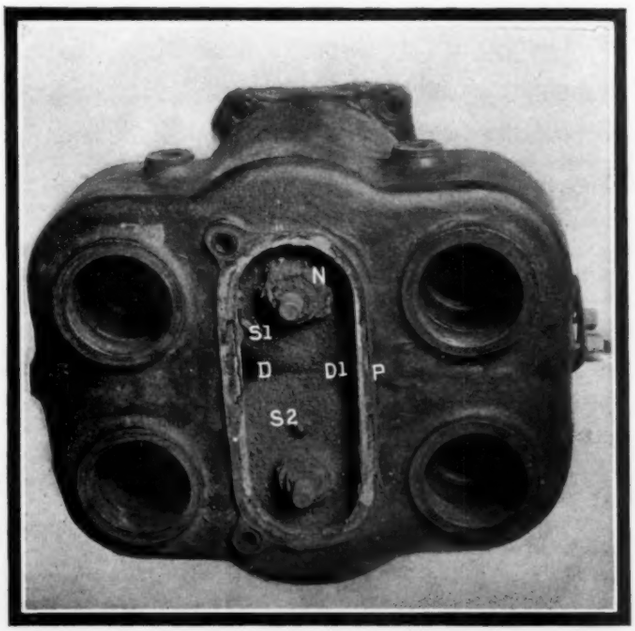


Fig. 1—Cylinder with cover removed, showing the formation of scale within the water jacket space, causing cranky action

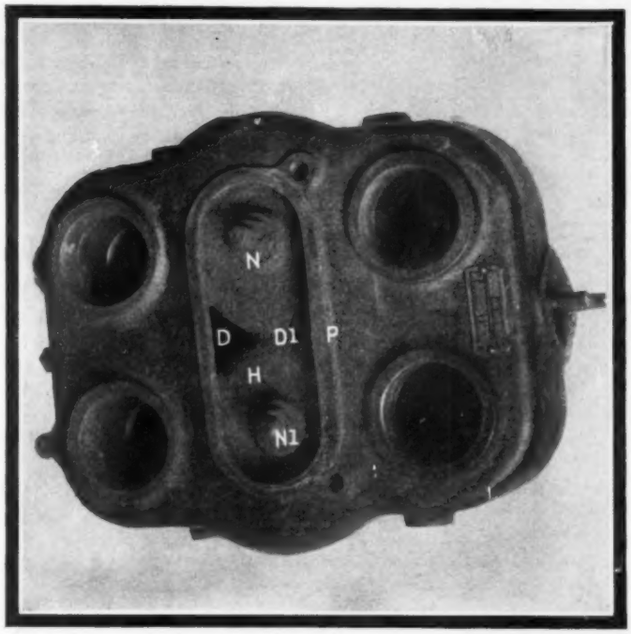


Fig. 2—Illustrating the result of the hot soda-washing process upon the cylinder removing all scale

The final operation before placing the motor into commission is to flush out the system so thoroughly as to remove all traces of the soda, fearing that the presence of even a small increment of the same will induce electrolytic and other undesirable actions, all to the detriment of the life of the radiator and the other but less delicate parts of the motor with which water comes into contact. The automobilist is cautioned not to give this final cleaning operation a lick and a promise.

The Chauffeur Got Away with a Hat

Sam—Say, Mose, wha did you-all git dat fabagastrin chapeau?

Mose—Wha you-all suppose I git it; I aint no millionai."

Sam—It am a fine top, Mose—come, now, wha you-all git it?"

Mose—Didn't you-all know dat I am a reg-lar licensed automobile driva an' didn't I run plumb over a white man, an' didn't he leave dis ya lid in de kyar; what mo do you-all wants to know?

Gasoline from Russia

Satisfactorily in American Motors

Foreign Fuel Must Be "Standardized" Before It Will Work

TI TIMES-STA

AUTO'S GROWTH BRINGS GASOLINE FROM SUMATRA

Cincinnati Concern Importing Fuel for Petrol Wagons.

Rumors of a deal by which the Indian Refining company of Cincinnati has made business connections with the Asiatic Oil company of Russia were explained by President Levering Friday as follows: "The Asiatic Oil company operates refineries on the island of Sumatra. We purchase gasoline from it, and it is shipped in tank vessels to this country. The growth of the automobile popularity has made the supply of gasoline in this country less than the demand."

WHEN the time comes that the supply of gasoline has to be replenished, or better yet, reinforced, by importing "crude," refining it here and making "blends" that will be on poor speaking terms with a "standard," it will then be time for the automobilists of this country to take an interest in this matter and advocate a definite mixture for what is now termed "automobile gasoline." The reproduction here of a news item under a "single scarehead" is for the purpose of having something to talk around, the idea being to bring out one or two of the situations that will have to receive attention in the long run.

When automobiles are imported, the first difficulty that the user experiences is that the carbureter adjustment is awry, due to the difference between the gasoline that was used on the other side for the adjusting of the same and the fuel that is available here for the operation of the car. In a word, if a car is designed to run on the grades of gasoline that are used in England and upon the Continent, the results that will be realized when the automobile is shipped to this country will be far from satisfactory.

How this character of trouble is to be overcome if gasoline is to be a "blend" of the wells of the world, is a detail that the distillers of the hydro-carbons have failed to throw light upon, although, according to the "news item" here given, it is the plan of these distillers to "try it on the dog." What is required of the whole situation is more light, added information of a more definite sort, and assurance from the proper source, that the fuel, as furnished, will be up to some standard.

All the effort that designers of automobiles can lavish upon motors will be of small avail if it can be said in the end that the fuel is mostly noted for the uncertainties that reside in it. But this view must not be taken to indicate that there should be any desire to restrict the sources of the supply of automobile fuel. The present demand is large; *it is but a sample.* The time will come—and it is traveling in this direction on a train that is not to be beaten by a "20th Century Limited"—when the demand for automobile gasoline will be double, quadruple, and octuple the present requirement. There are, to-day, in America, 486,000 automobiles in actual use, but it is to be remembered that 188,000 of these automobiles *were made last year.*

The story of gasoline is a romance, the like of which is only equaled by the story of rubber, that queer substance that strayed into mechanics, in relation to which it is proper to say it has only enemies, and all of its enemies are its staunchest friends—it is like a ghost; the person who meets it in the dark, hangs on like grim death—he is afraid to let go. At all events, referring to gasoline, it was a drug on the market but a few short years ago, and it was a very troublesome drug at that. The distillers of oil were in sad fix; they could find no use for more than a small part of the gasoline that they had to handle in the regular way, in the process of distilling "crude," to produce kerosene, lubricating oil, and the other products for which there was a brisk demand, but strange to relate they could not get rid of the gasoline. This material resisted all ingenuity; it could not be dumped into the river because it would float on the top of the water and, if set on fire, would make a river of fire; it could not be left around forming a pool, and the only thing that could be done, apparently, was to store it and await the coming of the day when ingenious man could determine how its potential force could be put to useful work.

The gasoline stove of a decade ago was a most promising proposition, but it was a dangerous liquid to place in the keeping of the average servant in the kitchen of the home, and while it did find a use in this way, the fact remains that there was not enough of a market for it to satisfy the commercial situation.

Crude Oil, in the Early Days, Was a Puzzle to Distillers in Some Particulars

When automobiles began to put in an appearance, it was a promising epoch for gasoline, but the distillers were never quite able to see in what straits they would be placed within a few short years.

The distillers of "crude" were in the same position as the merchants who are now lagging behind the procession, due to the lack of appreciation of the better work that the automobile can do for him, displacing the horse, of course. But it is a good thing for the automobile business; were all the merchants to awaken at one time, every maker of automobiles in America would be so pestered with demands for cars that he would be drunk with business.

Granting that the demand for cars is to be graduated so that there is no likelihood that the makers will be "intoxicated" beyond capacity, it remains to be wise; there is no reason why the work that must be done should be allowed to languish. The idea that the supply of gasoline will come somehow is a good one to harbor after a hard day's work, when it is desired to place dull care in the locker in order that the victim will be in a better position to enjoy a hard-earned rest, but, upon awakening, after the rest, let it be remembered that the problem is there.

The great problem, when it comes before the automobile engineers of America to be solved, will have to be tackled in a scientific way, and all of the facts will have to be arrayed, like soldiers on parade, so that calm judgment may be used as the lever that will pry ignorance out of the fort that it now occupies—the liquid that is being used for fuel in automobile motors must be standardized.

Keep Brass Parts Lacquered

Use in Maintaining a Good Appearance

The Formula of a Good Lacquer for

LACQUER prepared as here given will prove efficacious in renovating the bright work, but it is necessary to prepare the surfaces to be lacquered if the results are to be satisfactory. For the surfaces, what is wanted is a high polish and absolute freedom from grease. The lacquer may be prepared thus: Bleached shellac, 60 grams; Manila copal, freshly powdered, 60 grams; gum mastic, 60 grams; absolute (grain) alcohol, 1 kilogram; coarsely powdered glass, small quantity; allowed to stand for (frequently shaking), 14 days; boracic acid, 1 gram. Filter and use, the best plan being to apply repeated thin coats.

Any desired color may be given to the lacquer by adding aniline dyes. A very little of the dye of the color selected will serve for the purpose. Red and blue will form clear solutions; green must be handled cautiously; it may have to be filtered; yellow is a good dye to handle. In applying lacquers it is desirable to go about it in the same way as shellac is applied—thin coats, deftly applied by means of a suitable brush, with very little rubbing; it will become tacky if it is fussed with very long.

When Judgment Whispers Don't

When the Senses Are Dulled Even an Alarm Clock Fails of Its Purpose. Don't Select Such a Time for the Conduct of Important Negotiations

Don't skimp on the amount of lubricating oil just because the salesman tells you that the bearings are extra large—an extra allowance of grit might get in and rub the newness off the surfaces.

Don't wait for a "spill" before making adjustments of the brakes.

Don't test out the emergency brakes during an emergency—try them each morning before taking to the pike.

Don't give the dry cells six months to dry out and then switch over only to find that they are ripe for replacement.

Don't stand for a sag in the live rear axle—take a half day off and tighten up on the bob-stays.

Don't drill holes in the sideframe—if the designer thought that they were too liberal in size, he would have saved a little on the cost of metal.

Don't empty out the gasoline tank and then go around it with a lighted candle—there will be enough gas left in the tank to teach you better.

Don't allow the clutch to do service after it shows that it is not in fettle to hold the car—reface the clutch and avoid serious consequences.

Don't spill oil into the crevices of the magneto. The windings are insulated with cotton and this vegetable fiber is not proof against the wiles of the lubricating material.

Don't fail to supply the wants of the magneto from the lubrication point of view—this means that a little of the good quality lubricating oil should be used.

Don't tamper with the adjustments of the magneto—if you do not understand that language, go it on faith until you come to a pilgrim who is suitably endowed.

Don't batter up the insulation on the high-tension cables—rubber compound is used for this purpose and it should be handled with care.

Don't allow the high-tension cables to rub against metal parts, especially if they are hot. They will chafe, or the insulation will be destroyed by the heat.

Don't replenish the water supply from a convenient mud-puddle—a very thin coating of scale over the surfaces of the radiator will reduce its efficiency over 33 per cent.

Don't go along the road with a steaming radiator—it simply means that the motor is being run on a retarded spark.

Don't allow a motor to run without attention until it emits strange noises—the damage may then be done.

Don't allow your automobile to complain for lack of attention. A little attention every day is far better than a lot of work every Saturday.

Don't place too much reliance upon ball bearings in the road wheels of your automobile—they may be ever so fine, but this is no reason why they should not be cleaned, inspected and freshly lubricated at reasonable intervals.

Don't wait for the sun to shine on both sides of the street before cleaning up your automobile—it will soon be time to place the car in commission.

Don't allow the extra tires to rest on the running-board subject to the abuse of light, hail, rain, dust and other enemies of rubber and cotton—get a case.

Don't neglect the top. True, it is made of good material and will put up with a lot of abuse, but it will show that it is being neglected.

Don't forget that the fates are appeased the more readily if you do a little of the work.

Don't take along so many tools that you will be unable to pick out the one that you need.

Don't throw the tools into a large tool-box with a mess of junk—get a kit!

Don't place your spare inner tubes in a box with tools—the inner tubes will resent such treatment.

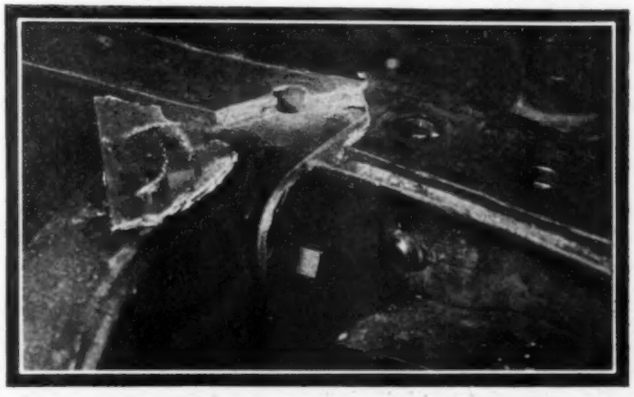
Don't neglect to keep inner tubes in a suitable place, protecting them from light, foreign matter and mechanical contact.

How Frame Was Broken

Shock Absorber Did More Harm Than Good in This Instance Through Incompetent Fitting

MORE damage is done to automobiles by users who tinker with them than is consummated by service under normal road conditions. It seems to be a disease. One writer called it "tinkeritis"—his idea of the situation was not a bad one. It is not that shock absorbers are to be looked down upon, but it does seem as if they ought to be fitted to cars by one who will take into account the fact that the side bars of the frame are no stronger than they ought to be and that the metal should not be drilled and filed away, unless holes are made in the neutral section if at all. As an illustration of what happens betimes when the work is done by a novice, the illustration* here given will suffice. The shock absorber was applied originally in such a way that when the work came upon it the load was so concentrated that it pushed the flange upward and it fractured at the rivet hole. The frame was materially damaged in other respects, and, while a repair was made by placing a reinforcing plate inside, riveting it to the broken member and bolting to the cross bar besides, as indicated, even so it is impossible to say of a repaired frame that it will equal in serviceability the original member. When the repair was completed the part of the flange that was broken out was replaced and the repairman showed that he had made the most of a bad job.

*Photograph taken at the Sidney B. Bowman Auto Company's Garage, New York City.



Showing how the frame of a car can be broken by improper fixing of accessories without regard to position

Owner Keeps Cost Account

Facts Are Only to Be Had from Those Who Know. This Is an Example of Very Acceptable Information

MUCH has been written from time to time for the enlightenment of the man who has not as yet indulged in the luxury, or necessity, whichever you will, of his first automobile, and who is, perhaps, somewhat curious to know to what extent he will be called upon to finance this delightful modern method of getting about.

This information, so far as the writer has observed, has been so fragmentary and incomplete as to be of little value to one seeking this kind of light. It may, therefore, be of interest to many to know of the writer's carefully kept record of four full driving seasons, covering a period of three and a half years and up to time of exchanging for a new car.

Of course when the matter of expense is to be considered it makes much difference what sort of car one has in mind—whether a large, medium or small car, and whether or not a chauffeur is to be employed. In the present case the writer cared for and drove his own car, and would say in passing that having the time, and being mechanically inclined, very much of his pleasure has been derived in this way.

The car was a five-passenger, four-cylinder, 35-horsepower touring with 34 x 4 tires, and weighed about 3700 pounds, with equipment and five average people aboard. This car, with top, speedometer and windshield, cost $2,600 and was in service, except for time consumed in two overhaulings, from May, 1907, to Dec., 1910, although but little driving was done in Winter except when the roads were in good condition. The mileage by actual speedometer record was 15,200, which, it will be noted, is 3,800 miles per season, or a little more than the experts figure as the average car's yearly mileage.

Owned the car 189 weeks, which makes the average expense per week, everything included, about $21.50 for full period.

Going somewhat into details concerning the expense here enumerated, I find three complete sets of tires or outer casings, including the set coming with the car, were used, making an average of 5,000 miles per set. About six inner tubes were bought. As stated, an electric vulcanizer was bought and used, thereby very materially reducing tire expense.

The items of expense were as follows:

Tires, new and repairs	$489.00
Gasoline, 1,623 gallons	237.00
Cylinder oil and grease	43.00
Sundries—shock absorbers, vulcanizer, tire irons, etc.	133.00
Two overhaulings, including varnishing, unisparker, new carbureter, etc., also incidental garage expense	475.00
Total operating expense	$1,379.00

To this must be added—

Insurance, liability only	$231.00
Interest on $2,600, 3 yrs. 7 mos. at 5%	465.00
Interest on $500, cost of garage	90.00
Depreciation, being allowed $600 for old car	1,900.00
Total expense	$4,063.00

The gasoline consumed figures 9 1-2 miles per gallon, which I consider a fair result considering much driving was done in hilly country. Cylinder oil averaged about 300 miles per gallon.

In the foregoing record of expense many large items of cost not strictly chargeable to the car, but necessary nevertheless, will have to be considered, such as special wearing apparel for man and wife, winter and summer robes, etc., which will hardly foot up to less than $500.

In conclusion would say that looking after my own car and seeing that things were right before starting out, very, very few road troubles have been met with, and the writer would say to all so inclined, and who can see the way clear to do so, by all means get an automobile.

Dealing with Chassis Springs

To Avoid Spring Failures the Quantity of Material Used Must Be Adequate

GRANTING that the material of which the springs are made is the best for the purpose, and remembering that springs have to withstand a greater measure of abuse than any other part of an automobile, it remains to take note of the fact that the average designer seems to be satisfied with a relatively small effort on his part, leaving it to the material to do the rest. In the designing of the springs there is one point that is not always taken note of—the formula used in the fixing of the proportioning of the plates takes no account of the quantity of the material that should be employed.

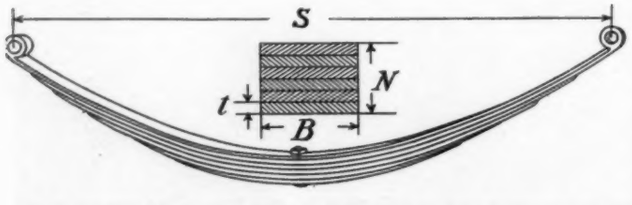


Fig. 1—Showing a half elliptic spring and a cross section of the same with letter references for use in connection with the formula as given in the text

The formula that serves in the average of cases is as follows:

Let

S = span as indicated in Fig. 1.

B = breadth of plate.

t = thickness of plate in 1-16 inch units.

W = load in tons (2,240 pounds per ton).

N = number of plates.

k = a constant—11 for the average undertaking.

When

$$N = \frac{W S k}{B t^2}$$

Were this formula to be the only guide, as it probably is in some cases, no account would be taken of the amount of work that would be put upon the material, as extreme fiber strain, dynamic work, etc. Experience is worth more than formulæ in work of this character, and most designers rely upon accomplishment more than they do upon formulæ. It has been found in practice that the plates should be wide, and in the better grades

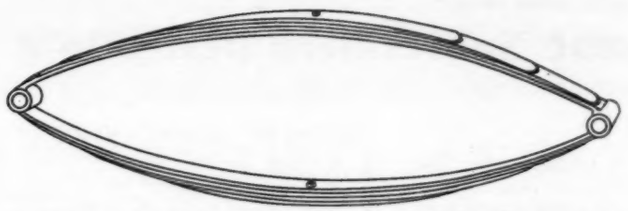


Fig. 2—Conventional type of full elliptic spring which is made up of two halves of the spring as shown in Fig. 1

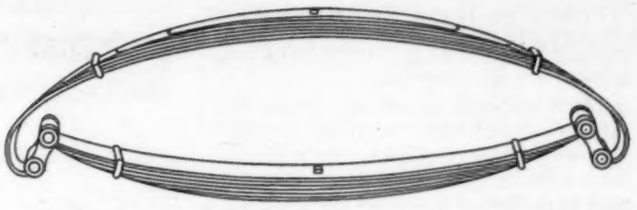


Fig. 4—Full elliptic full scroll type of spring with shackles and retainers

of automobile springs, taking the larger cars as examples, the value of B is 2 1-4 inches.

The number of the plates to employ is not so easy to fix upon, but it is possible to take note of the best practice and be guided accordingly. As a rule, the number of the plates that are used in practice should be more than the formula would be likely to indicate.

The dimensions of the plate stock which is available for the making of springs is given as follows:

DIMENSIONS OF PLATE-STOCK AVAILABLE FOR THE MAKING OF SPRINGS

B. W. G. Number	Thickness in Inches
0	0.34
1	0.30
2	0.284
3	0.259
4	0.238
5	0.220

The master plate should be thicker than the remaining plates. The thickness of all but the master plate may be the same. The plates should be thin, rather than thick, and they should be wide, rather than narrow.

If it is desired to obtain a "soft" performance of the automobile on the road, the best way to go about it is to make the span S relatively long and to use a considerable number of plates, but in this practice there is the chance that the springs will not be initially supple, and to get around this class of trouble it is necessary to use deep cushions in the seats. The deepest cushion now in use is 28 inches. This is quite a departure from the practice of some of the designers who seem to think that a 3-inch cushion is all that is required, and it is their idea that the springs should do all of the work. Speed has something to do with this matter and it stands to reason that low speed offers less of difficulty.

Were it not for the fact that there are more spring failures in automobile work at the present time than there is of other classes of failure, it might be possible to take their word for it. Since the reverse is true, and in view of the fact that the desired performance can be brought about through the use of springs with more material in them accompanied by deep cushions to take care of the initial performance, remembering that deep cushions do not fail in service, this plan offers relief from one of the main troubles of the average automobilist; moreover, the result in practice seems to be an improvement on all other plans.

Soft Riding Depends Upon the Springs

From the point of view of easy-riding qualities, after having accomplished all that deep cushions are capable of effecting, it remains to adjust the span S of the springs in the light of the width and number of the plates, after taking into account the type of springs that are to be used in a given case. If the half-elliptic type of spring as shown in Fig. 1 is adopted, the length of span should be accordingly more than will be required for Fig. 2, but the number of plates and the width thereof will have to be increased also. Comparing Fig. 2 with Fig. 3, it will be seen that the scroll at one end of the spring (Fig. 3) will add materially to the suppleness of the performance, but in proportion as this quality is induced a compensating factor must be allowed for, either in the shape of wider plates or more of them, unless a compromise is indulged in, resulting in a slightly increased width of the plates, and a slight increase in the number of the plates also. Referring to Fig. 4, which shows the scroll on both ends of one-half of the full-elliptic type of spring, it undoubtedly has certain advantages over Fig. 3 on some of the counts, but there are disconcerting factors as, for illustration, the fore and aft oscillations are not snubbed so effectively when this type of spring is used.

The platform type of spring as shown in Fig. 5 offers an excellent means of advantageously employing enough of the spring material to afford long life and a sufficiency of the spring action to take care of the vertical bounce, either on a heavy limousine at the rear or in certain types of commercial vehicles. There seems to be no good reason why platfrom springs should be used at the front end of an automobile, due to the fact that the motor is the principal load to be carried at that end and it follows that the loading is substantially constant.

The breakage of springs is not entirely due to the limited use of material, nor can all the breakages be attributed to inferior grades of steel. The practice of uniformly curving the plates so that they are distorted at the point of clamping where they rest on the perch seems to be a poor one, and it is believed that spring breakages are partly due to this fact and to the probability that the plates are not clamped tightly at the perch or to the elongation of the U-bolts after they are in service for a little while. There is one other reason for spring breakage that may be traced to something besides poor material, or an insufficiency thereof. In other words, unless all of the plates are bowed to the same radius, the extreme fiber strain will not be the same in each of them and the plates that are stressed excessively are the ones which will fracture.

Some of the spring breakages may be directly traced to lack of lubrication. There are very few automobilists who have the right idea in relation to this important matter, and it is even possible to find designers who will contend that if the friction between the plates is increased, the amount of energy that will be dissipated during spring action will be more and that the result will be better. There is really nothing in this claim. A lubricant should be used between the spring plates, for then the plates will slide upon each other more smoothly, and the loss of energy will be confined to the work done in the shearing of the lubricant, leaving it to the plates to perform their allotted function, which is a duty that seems to be quite up to their ability, even under favorable conditions.

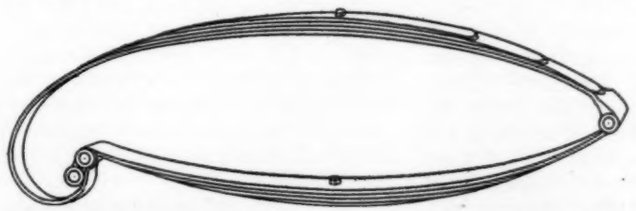


Fig. 3—Full elliptic spring with one end of the top member in the shape of a scroll

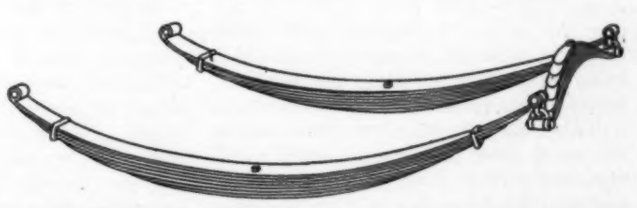


Fig. 5—Platform type of spring showing the shackling of the cross member and the use of retainers

What Some Subscribers Desire to Know

The Editor invites owners and drivers of automobiles who are subscribers to THE AUTOMOBILE to communicate their automobile troubles, stating them briefly, on one side of the paper only, giving as clear a diagnosis as possible in each case, and a sketch, even though it may be rough, for the purpose of aiding the Editor to understand the nature of the difficulty. Each letter will be answered in these columns in the order of its receipt. The name and address of the subscriber must be given, as evidence of good faith, adding a nom de plume if the writer desires to withhold his name from publication.

Those Who Have Had Experience Are Invited to Contribute

Editor THE AUTOMOBILE:

[2,541]—Would you kindly state what opinion you entertain regarding the value or saving on tires that have some kind of inner tube casing. They are advertised to save blow-outs and a large percentage of punctures. What inner tube casing is supposed to be the best? E. C. B.

Auburn, Me.

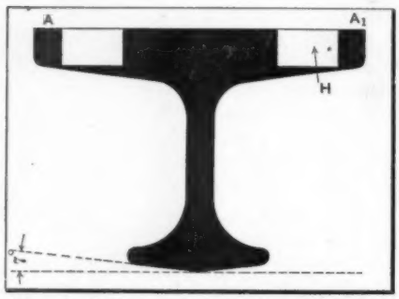


Fig. 1—Section of a front axle, showing the spring plate on which the spring should seat firmly

Information Wanted About a Motor

Editor THE AUTOMOBILE:

[2,542]—Kindly inform me through your Questions and Answers column:

1. What is the absolute compression in the fuel injection type of the Antoinette aeroplane motors?

2. At what crank angle is the fuel injected?

3. What style of check valve is used between the fuel pump and the cylinder?

4. What size fuel pipe is used?

Can you give me a description of the fuel pump and check valve?

Muskegon, Mich. R. A. WEINHARDT.

Object Sought Is the Same in Any Case

Editor THE AUTOMOBILE:

[2,543]—Please inform me through THE AUTOMOBILE how to adjust a Stromberg carbureter. Is there more than one way? Are other carbureters adjusted the same way? PHILIP L. ALLISON.

Burson, Cal.

It is the function of a carbureter to deliver an efficient mixture of gasoline and air to the motor. All carbureters which are designed to include an auxiliary air port, if they are not complicated by other mechanisms, are adjusted first to make the motor run as slow as possible, with the auxiliary air port closed, the idea being to adjust the flow of gasoline in such a way as to realize easy cranking, and maximum power at low speed. Having accomplished this adjustment satisfactorily, it remains to run the motor at increasing speed up to the highest point by opening the auxiliary air port, and finally ending in the adjustment of the auxiliary air valve to give permanence to the range of performance. The several makers of carbureters issue instructions in relation to the details attending the adjustment of their devices and you will doubtless be able to get copies of these instructions by communicating with them.

Causes of Spring Breakage

Editor THE AUTOMOBILE:

[2,544]—I have been puzzled recently to find out the cause of the springs of my car breaking. After I had run the car for several hundred miles I found the lower leaf of the front spring had snapped sharp off at the point of contact with the axle plate. I had a new plate fitted by a local man exactly similar to the old one and the same thing has happened again. This I have had again repaired and to my astonishment I find that one of the rear spring plates has broken in the same manner. Could you tell me the reason for this? R. D.

Boston, Mass.

The cause is probably due to the fact that the leaf of the spring is semicircular and the plate as shown in Fig. 1 is flat so that there is a gap between the leaf and the plate at the points A and A1. When the load is thrown on the plate forcibly instead of the spring finding a firm seating the gap causes the plate of the spring to overbend itself and after a few such blows becomes cut by the sharp edges A and A1 of the plate and so breaks. A method of overcoming this is to fit a hard fiber block between the spring and the plate, taking care to file the block so that it fits the curvature of the spring. In Fig. 2 the spring-clip U often has something to do with springs giving way in the manner indicated in your letter. After the car has run about 100 miles the nuts N and N1 should be tightened as the part U is bound to elongate slightly and cause a certain amount of looseness. These nuts should be tightened periodically for this reason.

Practice Is Not the Same with the Magnetos

Editor THE AUTOMOBILE:

[2,545]—Please answer the following question in the next issue of THE AUTOMOBILE: Are all magnetos that are used on 4 and 6-cylinder automobile motors timed so that their operating shaft revolves at one-half the speed of the motor crankshaft, on motors of the 4-cycle type, and the same speed as the crankshaft on motors of the 2-cycle type? SUBSCRIBER.

Merkel, Texas.

Some Reasons for Heating Car bureters

[2,546]—What is the effect of heating the gases before they are taken into the engine? Is it possible to overheat them?

Waterloo, Ia. READER.

Heating the entering gas increases its inflammability. It also increases the range of allowable dilution permissible while still allowing the mixture to explode, whether that dilution be with air or with an incombustible gas. Heating the incoming gas also allows it to remain inflammable at a lower compression pressure. This heating is practically limited to the slight heat necessary to supply the loss of heat of the gasoline due to its vaporization. Excessive heating leads to the danger of preignition, owing to the heat given to the gas by the act of compression. Even before compression the gas becomes heated by the hot

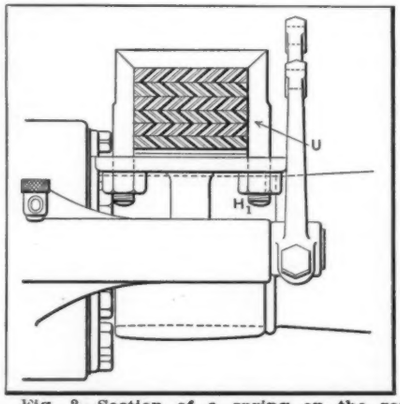


Fig. 2—Section of a spring on the rear axle showing the U-spring clips and tightening nuts.

cylinders and ports, by the throttling effect of the intake where the energy of velocity of the gas is transformed into heat, and by the admixture of the fresh gas with the residue of burnt gas in the clearance space. The temperature may be as high as 392 degrees Fahrenheit before compression. There is a partial gain from this, because

What Other Subscribers Have to Say

The Editor invites owners and drivers of automobiles who are subscribers to THE AUTOMOBILE to communicate their personal experiences for publication in these columns for the worthy purpose of aiding brother automobilists who may be in need of just the information that this process will afford. Communications should be brief, on one side of the paper only, and clearly put, including a rough sketch when it is possible to do so, and the name and address of the writer should be given as evidence of good faith, adding a nom de plume if the writer desires to withhold his name from publication.

heat obtained from the hot cylinders and ports tends to increase the compression pressure and therefore the efficiency. There is a partial loss, because heating before compression results in a higher maximum temperature and therefore more loss to the cylinder walls.

If the gas were initially supplied under pressure it might be slightly heated with some net advantage, as it might facilitate the use of a poorer mixture.

According to tests carried out by D. Clark, the temperature of the gas during the explosion stroke ranges from 510 degrees to 1,600 degrees centigrade.

Satisfactory Testimony

Editor THE AUTOMOBILE:

[2,547]—I am a subscriber to THE AUTOMOBILE, and would like to ask your opinion as to "Homo," advertised on page 110 of your October 10 issue. Do you think that the "Homo" is practical, and will it do what its promoters claim for it? I have a 2-cylinder runabout Maxwell, 12-horsepower, and am thinking of purchasing one if I can find that they give satisfaction.

Rensal, N. D. GEORGE E. BERG.

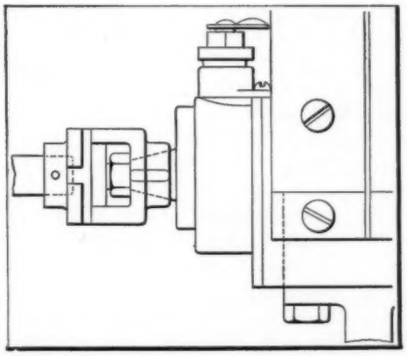


Fig. 6—Showing how the magneto is connected to the driveshaft by means of a compound Oldham coupling

Just a Few Little Designing Problems

Editor THE AUTOMOBILE:

[2,548]—The following questions I wish you would answer for me in your columns:

1. Should the design of a crankshaft for a given motor be changed if the motor is to be equipped with roller bearings instead of plain ones? If so, how, and why?

2. If a motor has a compression of say 10 pounds gauge when cold, what will the compression be when the motor has reached a constant running temperature, due to heated surroundings, walls, etc., tending to keep the temperature of the mixture higher at the point of maximum piston travel?

3. At what temperature will a charge of gas (perfect mixture) explode—self-ignite?

4. How can the maximum explosion pressure be determined when a certain amount of oxygen is introduced into the charge?

5. If the explosion pressure were too great, what part would suffer injury first, *i.e.*, break: cylinder, load connecting rod, piston or crankshaft?

6. What is the bursting pressure of the average cylinder, and is the maximum for small cylinders greater than large ones or vice versa? Also, what factor of safety is used in designing same. SUBSCRIBER.

New Haven, Conn.

1. The proportions of the crankshaft must be determined from data which will tell (a) of the twisting moment, (b) of the bending moment, (c) of the variation in twisting moment, (e) of the synchronism of the odd harmonics set up in the crankshaft, (f) of the unbalanced secondary component, (g) of the cantilever effect of the flywheel, (h) of the gyrations of the flywheel, (i) of the spiraling of the crankcase, (j) considering the kinetic ability of the steel, (k) involving the hardness of the steel from the four customary hardness points of view, (l) fixing the dimensions of the pins and throws in view of the local moments in their various aspects, and there are 10 or 12 other more or less important considerations besides. The bearings bear the same relation to the crankshaft as the abutments hold to the Brooklyn Bridge. They may be of the plain type, or they may be ball or roller bearings; the distance between supports is the prime point to consider. From the point of view of the bearings only, it remains to observe that they must be big enough to do the work. Perhaps either of the type of bearings in vogue will work with equal satisfaction if the bearings are of good quality, and the sizes selected are sufficiently liberal.

2. No motor will work if the compression is only 10 pounds gauge. In practice, the gauge pressure is rarely ever below 60 pounds per square inch, nor should it exceed 80 pounds per square inch, if gasoline is used as the fuel. At all events, the fact remains that the compression will decrease, partly on account of the wire drawing of the mixture through the valves and constricted passage-ways; then again, because heat rarifies the gases by the simple process of swelling the molecules so that a less number of them will go to make up a bushel.

3. It has been found in practice that automobile gasoline when mixed with air in the right proportions will preignite invariably at about 120 pounds per square inch absolute. In racing automobiles the compression is fixed at about 95 pounds per square inch absolute. In passenger automobiles the pressure is not far from 75 pounds per square inch absolute. The absolute pressure is 14.7 pounds per square inch above the gauge pressure.

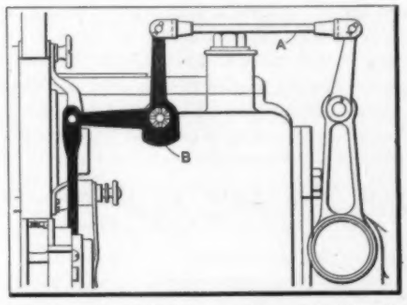


Fig. 8—Rear end of a motor, showing the magneto connections

4. It is recommended that Cantor lectures be studied, they bringing out all of the points in relation to the fuel. They have recently been run in THE AUTOMOBILE.

5. The weakest part.

6. Engineers generally figure that the tensile strength of cast iron is 18,000 pounds per square inch. It may be as high as 26,000 pounds per square inch, and 35,000 pounds per square inch is not impossible in extreme cases, but the lower figure is the one to take. The cylinders should be so designed that the working strain will not exceed one-quarter of 18,000 pounds per square inch. Unfortunately, the foundry problem takes precedence over other considerations, and it is deemed inexpedient to have the walls of a thickness below 1-4 inch. This thickness affords a factor of safety somewhat higher than 4 to 1.

Magneto Advance Lever

Editor THE AUTOMOBILE:

[2,549]—Having the intention of fitting a magneto to my car I would be obliged if you would give me some idea through your columns as to the manner of fixing the advance lever. I propose fitting an elongation to the pump shaft which runs at engine speed and fitting a base plate at the rear of the motor on the opposite side

to the steering column. Could you give me a sketch of a simple coupling?

Philadelphia, Pa. MAGNETO.

A simple manner to do this is to fit a bracket to the frame or the rear part of the motor to carry the cross shaft A1. To this should be fitted a lever connecting with the bell crank B, shown in Fig. 3.

A bracket and axis for this can be fitted to the motor. The rod connecting the bell crank and the lever A1 should be threaded for adjustment purposes.

The coupling shown in Fig. 6 is simple to make. The coupling attached to the pumpshaft extension has a plain slot in it, likewise the magneto coupling shown. Between these there is a washer with tongue pieces at right angles to one another, which engage the members and is an inexpensive part to renew in case of wear.

You Will Have to Locate the Source of the Noise

Editor THE AUTOMOBILE:

[2,550]—I am the owner of a 2-cylinder car which is in perfect order, and for hill-climbing has no equal. The only fault I find with the motor is its harsh sounding noise. This seems to come directly from the cylinders. I am of the opinion that by putting on a silent muffler, and a 2-inch exhaust pipe instead of a 1 1-2-inch I could stop the noise, as otherwise the motor is in perfect condition. Kindly advise me through your valuable paper whether I am right, or whether you have a better suggestion for eliminating the noise. H. D. B.

Haverstraw, N. Y.

You do not state whether or not the 2-cylinder motor is of the opposed type, or what. The noise that you complain of might be due to wheezing. It may be that the joints of the crankcase are not tight, and due to piston displacement the air is drawn in and out through the crevices, thus producing noise. It is also possible that the valve stems are loose in their guides, and that the exhaust makes a noise as it passes down along the stem, or air may be sucked in through the same openings. You might also look for loose joints around the flanging of the manifolds. It does not necessarily follow that a larger exhaust pipe will result in a reduction of noise; it is the practice of some makers to use a very small diameter exhaust pipe leading from each cylinder to a receiver. The receiver is the form of a relatively large diameter pipe placed alongside of the motor, making the small diameter connections about 18 inches long. These small diameter connections are sometimes approximately one inch for a motor with a bore of four inches. This makes the area of the constricted pipe 1-16 of the area of the piston, but the receiver in these examples is about half the diameter of the cylinder.

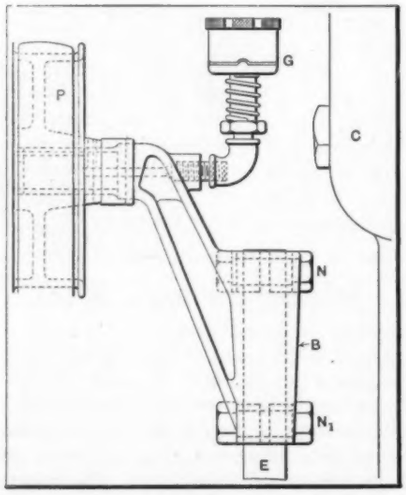


Fig. 4—Type of fan bracket with simple adjustment and good provision for lubrication.

It Would Be Possible to Set the Steering Post at Any Angle

Editor THE AUTOMOBILE:

[2,551]—Will you please tell me through your columns of "Letters Interesting Answered and Discussed" the following question: Can a steering wheel be lowered so as to come almost directly out without any slant? GEORGE E. GRIMES.

Crawfordsville, Ind.

Wobbly Flywheel

Editor THE AUTOMOBILE:

[2,552]—I have recently noticed a lot of undue vibration in the running of my car, and on examining the motor I find that the flywheel wobbles. I have taken great care of the car and cannot understand the cause. Do you think the crankshaft is bent? F. S.

Springfield, Mass.

If the motor runs satisfactorily outside the vibration it is probable that the nuts holding the flywheel on to the crankshaft flange, as seen at N and N1 in Fig. 5, have backed off slightly and require tightening. In fitting flywheels it is not only necessary that the nuts should be split-pinned, but the nuts should be absolutely tight. In case the split pin does not exactly pass through the slots of the castle nut so that the hole in the bolt is uncovered, a slovenly workman will loosen the nut slightly so that it passes. If the split pin will not pass through the holes when the nut is tight, take the nut off and fit a washer, or, better still, pass the file over the base of the nut so that it will go farther on the thread.

Fan Bracket and Greaser

Editor THE AUTOMOBILE:

[2,553]—There is no adjustment on my car for tightening the fan belt and as the present bracket is very heavy I propose taking it off and fitting a new one. Could you suggest something?

New York. SUBSCRIBER.

The design of fan bracket to fit and suit your car depends upon the amount of space available between the front cylinder and the radiator. The bracket shown in Fig. 4 is very simple and the method of adjustment can be seen. The pillar E is attached to a base and on this the bracket B slides when the tightening nuts N and N1 are slacked off, The greaser is connected with an elbow, and the spindle carrying the pulley should be hollow and cross-drilled to allow the grease to find its way easily into the bearing. If a plain bearing is used the spindle should have slots cut in it, slightly spiral, to form a conductor for the grease.

The Doctors Elect to Disagree

Editor THE AUTOMOBILE:

[2,554]—Has there ever been determined in any way by actual tests the difference in the rebound between a solid rubber tire or a filled one and a pneumatic tire pumped up as the makers demand a pneumatic shall be to give good service? I have asked several tire salesmen and also automobile salesmen what is the difference; the only reply I could get from them was as follows, viz., from the tire men, that the car will not be easy riding, and from the auto men, that the car would stand the solid tire, but that the rider would not have the solid tire, on account of the jar, but mind you they (that is the latter) say that the car will stand the solid, and the tire man said that the car would not stand it. Whom am I to believe? Personally, I cannot see the difference between a tire pumped up to 100 pounds (which is demanded of me with the tires on my machine) and a solid tire or a filled tire. I have asked several people who have had tires filled with a preparation, men who are very prominent both in the business and financial world, who say that they find no harm is done to their car, or apparently so, and see no difference in the riding qualities, and when riding in one of these cars with tires so filled, and not knowing until after the ride that they were filled, you have to admit candidly that you would never have known the difference. I am anxious to do something of the kind and thought your expert knowledge would guide me.

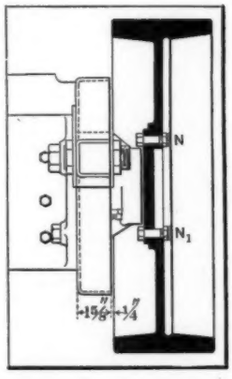


Fig. 5—Cross-section of a flywheel, showing how it is attached to the crankshaft.

A SUBSCRIBER.

Port Richmond, N. Y.

Taking the pneumatic tire inflated to 100 pounds per square inch and comparing it

with a solid tire of a size that would perform under precisely similar conditions, the conclusion that would have to be reached in relation to the relative performance of the two tires would be that the pneumatic tire would render the best service in certain respects, due to the fact that when the pneumatic tire receives the force of an impact, the energy so handed to the tire is distributed over its sections clear around the circumference, through the air. In the case of the solid tire, the force of the impact would be taken and distributed through a small zone of the rubber compound, due to the fact that the molecular relations are such that much of the energy will be dissipated, and this is another way for saying that the section of the compound is scarcely capable of transmitting a wave of motion through a considerable distance. The result is, in the case of the solid tire, that the blow is cushioned ineffectually, as compared with the cushioning effect of the air, even though the air pressure, in the case of the pneumatic tire, is held at such a high point that easy-riding qualities, so called, will not be present. But all solid tires are not alike. Some are relatively dead, due to the absence of much new rubber, and others are "live," because they have a large percentage of refined gum in them, and a considerable measure of the possible difficulty would have to be viewed after considering not only the quality of the rubber used, but the size of the tire as well. Thinking along these lines leads one to the conclusion that a comparison between solid and pneumatic tires, if it is under other than specific conditions, has too many pitfalls to be regarded as of great value.

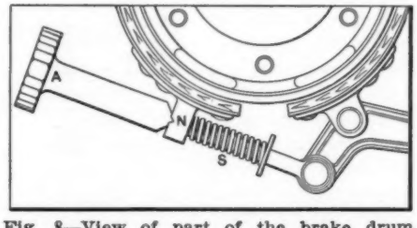


Fig. 8—View of part of the brake drum, showing a quick means of adjustment

Excellent Opportunity to Exercise Judgment

Editor THE AUTOMOBILE:

[2,555]—Being a subscriber to THE AUTOMOBILE and desirous of some information regarding a two-cycle engine for an automobile, I would like you to answer the following questions:

1. Is a two-cycle engine practical for a pleasure car?
2. Is trouble encountered in getting engines to explode regularly?
3. Is backfiring possible in the crankcase?
4. Is there any possibility of carbonizing in cylinders?
5. Do you think a thermo-syphon cooling system a good one?
6. Is a two-cycle engine harder to start than a four-cycle?
7. Of the Amplex, Atlas and Elmore two-cycle engines, which do you consider best, regardless of cost?
8. Does a two-cycle engine consume more gasoline under the same conditions than a four-cycle?
9. Would it be as good a hill-climber with the same gears in transmission?

Peru, Ill. A. M. P.

1. Yes.
2. Yes, if the engine is not properly made. No, if the engine is properly made.
3. Yes, if the design does not include some means of regulating the admission of the mixture. No, if the motor is suitably designed for the purpose.
4. There is not only a possibility but it is a fact that carbon does form in the cylinders of motors, but the amount of the deposit depends upon the efficacy of the design in the respective cases. Since this character of trouble is generously distributed between two and four-cycle types of motors, it remains for an intending purchaser to satisfy himself in relation to this matter under all conditions.
5. Yes.
6. Perhaps. It depends upon circumstances. Some four-cycle motors are hard to start; there are conditions under which two-cycle motors are extremely difficult to get under way.
7. The editor cannot answer this question. It would not be wise to do so. Obviously, a man cannot be the editor of a paper in New York and be perfectly familiar with the details of design and construction of three different makes of motors, distant from each other by several States. The best way to handle this matter is to examine the three different makes from your point of view, and see which of them you like best.
8. Gasoline consumption brings into question the thermic relations of motors. These relations are so complex that the best minds of the industry differ with each other considerably, and taking the records available, it would seem that it is more a question of the details of design of a motor than it is a matter of the cyclic relation. You will have no difficulty in finding out what the gasoline consumption is for any motor that you desire to purchase; measure the gasoline and run the automobile a hundred miles.
9. This question is too indefinite to warrant being answered.

Troubled with Noisy Exhaust

Editor THE AUTOMOBILE:

[2,556]—The noise of the exhaust on my car seems to have greatly increased recently and I am unable to find the cause. Do you think it is due to the silencer becoming sooted up? The power of the motor does not seem to have fallen off.

Atlanta, Ga. B. K.

The noise probably comes from a blow somewhere in the connections. A worn asbestos gasket is sufficient to cause this. It is very annoying and there seems to be more noise with a small blow than if there were no silencer at all. The points B in Fig. 7 are sometimes a source of trouble and we should suggest your looking over these. A large amount of soot will cause back pressure for a time and so expand the joints that in getting rid of one source of trouble another intervenes.

Quick Adjustment for Foot Brake

Editor THE AUTOMOBILE:

[2,557]—Is it possible to fit a quick adjuster for the foot brake of my car? At present every time I want to adjust it I have to lie on my back, take out split pins and bolts and get myself in a terribly dirty condition. The brake is two metal shoes of the locomotive type with a crank lever.

Albany, N. Y. SUBSCRIBER.

The type of adjustment shown in Fig. 8 would answer your purpose. It might necessitate removing the present crank and fittings and substituting one similar to those shown in the illustration. The connecting rod is threaded at the end and passes through the bracket, which has a notch N cut in it. The spring S is interposed between the washer and the boss on the bracket to hold the notch and the wedge at the end of the adjuster A in tension. The adjuster screws over the connecting rod and by turning the milled head the brake can be adjusted in a few seconds.

Another Defect Discovered in the Callan Law

Editor THE AUTOMOBILE:

[2,558]—Some one should give the State a "roast" for the inferior number plates that are being put out. They are a disgrace to any good car, and if I owned a $5,000 car I would refuse to put them on. I am ashamed to put them on my small runabout. W. M. F.

East Orange, N. J.

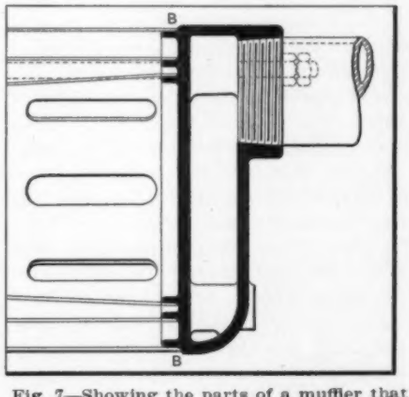


Fig. 7—Showing the parts of a muffler that are liable to cause a hissing noise if not properly tightened

Billings Had Trouble

Having a Month's Experience, He Declined to Be Instructed

NOTHING seemed to daunt Billings! He appreciated fully the advantages that are to be derived from being his own "consulting engineer." Having invested in a second-hand single-cylinder automobile, Billings was happy for a whole week, but at the end of that time he began to see wherein it would be necessary for him to do a little tinkering with the car. Not knowing just how to attack the problem, Billings went back to the man who sold him the car, and, having made known his want, was advised to call upon the brother of the second-hand man, who, by the way, was in the repair business in a building alongside of the second-hand place. It seemed to Billings that this was a very convenient arrangement, and he took advantage of it without ado.

Entering the repair shop, Billings accosted the man, and said: "My automobile is outside and I wish to have you look it over for the purpose of telling me what it is that I need to make the car run better than it does now?"

The man went with Billings, and, looking at the car for a moment, he said: "You will have to leave the car with me for a day or so; I will give it a good examination and let you know what I will have to do with it to put it in first-class shape."

Billings went away, leaving the automobile in the shop. The repairman, after Billings went out, turned to his confidant, and said: "He will be rare picking!"

Said the confidant: "What do you think is the matter with the 'junker'?"

"Nothing! That is to say, nothing that we can fix!"

It was a whole week before the repairman would consent to go near the car; Billings had him on the 'phone a number of times, but he always got the same reply: "We are working hard on the car, but it will be several days before we will be finished."

One fine day the repairman called a boy from the dark end of the shop, leading him up to the car, said: "Do you see that coil on the dash? Yes! Well, what I want you to do is to remove that good coil and replace it with an old one that you will find in my office. After the coil is in place, take a rag and some oil and rub it over. Having completed this task, remove all the spark plugs and replace them with some that you will find in a box in the storeroom—old ones. If you see anything else on the car that is any good, replace it with old stuff of which we have a-plenty! Do you understand?"

"Yes, sir!"

"Get busy!"

* * * * *

Billings was in a fever of anxiety when he came for the car; entering the *sanctum* of the repairman, he immediately fired a battery of questions at him, all of which were aimed for the purpose of eliciting information on the subject of the amount of work that had to be done to bring the automobile up to its new state of perfection, but the grunts that he received in reply were not in the language that he learned on his mother's knee. The repairman was busy making out the bill; itemizing the work; giving day and date for each addition of material and labor. After a long time this laborious task was completed.

"The bill, as you will see, is a large one! We had to do a great amount of work. There are numerous items that I did not include, *such as my time.* But I am sure that you will not have to come back here with the car for a year, at least."

"Four hundred and twenty-seven dollars and twenty cents! Why, I only paid $275 for the car in the first place. You cannot expect me to pay that bill! I simply refuse to have anything to do with it."

"You can do as you like! The law says that you can have this automobile when you settle with me."

"The law! Does the law authorize a robbery?"

"You did not make any agreement with me as to how much I was to charge. You did not limit me in the amount of work that I was to do. You did say, 'I want my car put in good working order,' and I have done just as you told me to."

"But I only paid $275 for the car! You now propose to charge me $427.20 for the repairing of it! Gad, man, what is it all about?"

"What is it all about, did you say? What is it all about? If you like a white man. If I put in $100 for 'professional servwill be all about a charge for it. I cannot afford to expend my time talking to you all day! That is what I get for treating you like a white man. If I put in $100 for 'professional services,' you would then be all right! But not having done so, you now put up a squeal!"

Six-Cylinder Motor en Bloc

Description of Delahaye Engine Showing Compact Design

A VERY interesting engine by the Delahaye Company, of France, is shown in Fig. 1, which is a real novelty in the way of motors. The engine referred to is the six-cylinder 18/24, 75 bore by 120 stroke. Looking at the engine one would not appreciate the fact that it is a six-cylinder type; except that the casting is a little higher, it could be well taken for a small bore en bloc motor. The engine is built on the V-shape principle, the cylinders being set at an acute angle and enclosed in one single water jacket, in which the valves, inlet and exhaust pipes are all enclosed and fitted at the side to each group of cylinders. By reason of the straight or vertical water jacket one can see nothing of the angle at which the cylinders are set. A single exhaust pipe is fitted on the left-hand side, and a single Claudel carbureter feeds all the cylinders; the inlet pipe has been ingeniously fitted within the casting, thereby adding to the slab-like appearance of the construction. The valve stems and springs are enclosed and are accessible by the removal of the aluminum plates.

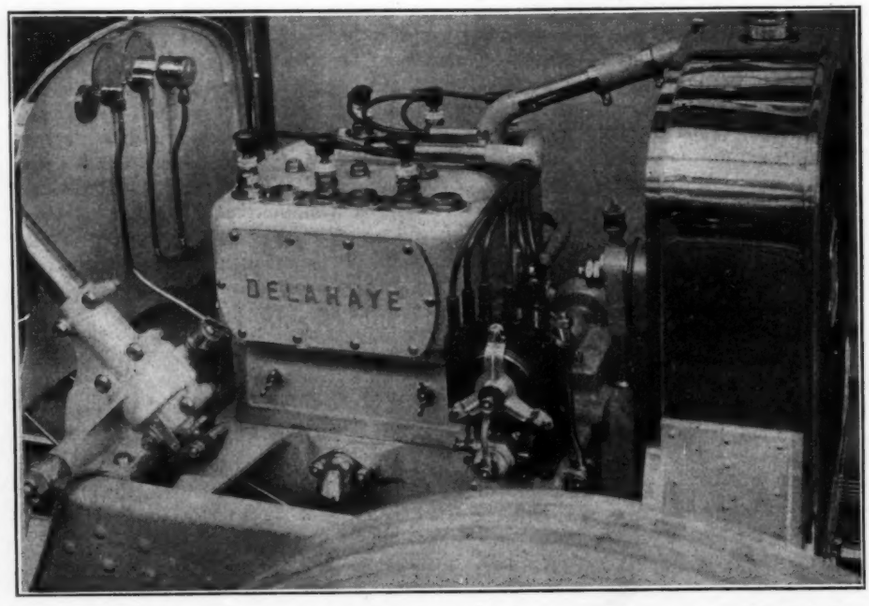


Fig. 1—Six-cylinder motor of the Delahaye type, with cylinders cast en bloc, arranged three on each side

Strength of Valve Springs

A Happy Medium—Neither Too Strong nor Too "Lazy"—Is Necessary to Give the Best Results

FEW problems are more troublesome to the operator of a car than the one involving the strength of the valve springs. If they are too strong the cams and lifts will be damaged too soon, but if they are not strong enough the timing will get out of order. It is not generally recognized that timing a motor is only a partial process, on account of the fact that the mechanism is only positive in one direction. True, the cam lifts the valve off of its seat at a set time, but the spring placed to close the valve is not positive. If the spring is "lazy" the angular rotation of the camshaft will be increased to excess before the valve will be pressed against the seat. On account of the structural changes that springs undergo it is impossible to so design them that they will be just right for the work to be done all the time, and it is the practice among makers to employ over-strong springs in new motors, with the expectation that they will never weaken to a point where they will fail to serve for the purpose.

The chances are that the pressure should be about 40 pounds per square inch between the valve and the seat, and that it will remain so at all times is highly improbable. If the spring is strong enough to withstand the work without mechanical or structural deterioration, independent of the effect of heat, it only remains to so place the same that its temper will not be drawn by the heat. Unfortunately springs are required to work up to the limit of their fiber ability, and they are likely to undergo some change from this account.

It would be good work were the springs placed to close valves capable of doing so within a rotation of 20 degrees of the camshaft. The angular travel of the camshaft is frequently more than 40 degrees. The method of calculating for this angle is given as follows:

Let,

θ = Angle of camshaft rotation during the closing of the valve under the action of the valve spring.

S = Speed of the camshaft in revolutions per minute.

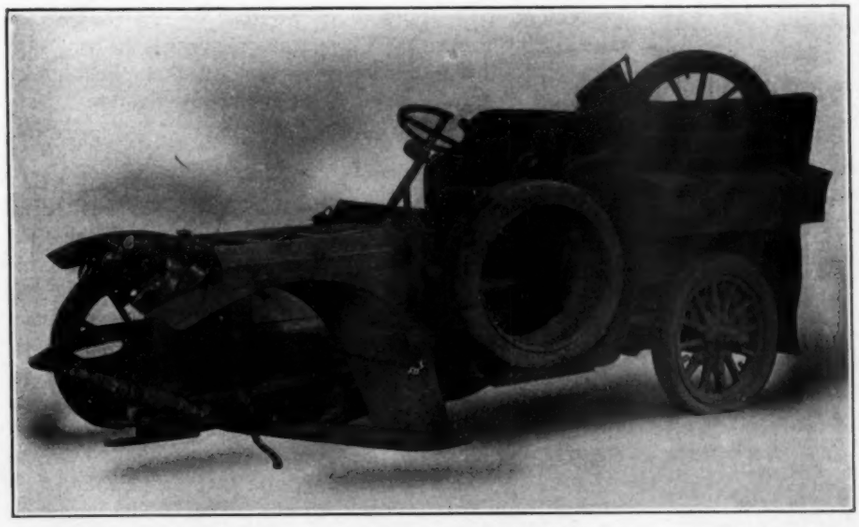
W = Weight of valve in pounds.

P = Mean pressure of the spring in pounds.

l = Lift of the valve in inches.

When,

$$\theta = \sqrt{\frac{l\ (SW)^2 W}{0.67\ P}}$$



Showing what happened to an automobile that was too old to stand hitting a bridge, which took off a wheel, but the owner was clever and managed to get home after rigging up a substitute for the wheel as indicated.

While noise is the normal expectation if the spring does not work properly, it is believed that the most noise comes from weak springs rather than when the pressure is excessive. To withstand the pressure the parts—roller, pin, cam-face and ends of the rods—must be of close-grained metal and well hardened.

Adjusting Carbureters

Weather Conditions, Fuel Density and Several Other Considerations Must Be Borne in Mind in Order to Get the Best Results

NEW carbureters are seldom as efficient on a wet day as on a dry day, on account of the reduced capacity of the air to absorb further moisture. For this reason an excess of gasoline must be supplied by increasing slightly the needle valve opening of the spray nozzle, if there is one. Carbureters having no spray needle are provided with other means of regulation, usually by modifying the suction at which the auxiliary valve opens. To produce an effect similar to enlarging the auxiliary air valve spring tension is increased, thus admitting less air.

A change in fuel density always demands readjustment, sometimes of every adjustable element, in order to get the best possible results. If the gasoline be heavier the float will ride higher and therefore maintain a lower gasoline level, thus demanding the adjustment of the float valve. As the heavier gasoline is more viscous the spray opening may need to be slightly enlarged. Additional heat is likely to be required. A marked change in altitude sometimes upsets carbureter equilibrium.

Every owner has to change adjustments more or less from winter to summer, although the best carbureter is that requiring the least change. Gasoline, like any other liquid, absorbs heat on evaporating, and unless the air and surrounding piping are warm enough to supply the heat easily the air may be so chilled as to freeze the moisture contained in it.

Coming Events

Catalogue of Future Happenings in the Automobile World That Will Help the Reader Keep His Dates Straight—Shows, Annual Meetings and Other Events.

Shows and Exhibitions

Mar. 14-18	Syracuse, N. Y., Third Annual Show, Syracuse Automobile Dealers' Association, State Armory.
Mar. 14-18	Denver, Col., Annual Automobile Show, Management Motor Field, Colorado Auditorium.
Mar. 15-18	Louisville, Ky., Annual Show, Louisville Automobile Dealers' Association, First Regiment Armory.
Mar. 18-25	Pittsburg Annual Show, Pittsburg Auto Show Association (Inc.), Exposition Hall.
Mar. 25-Apr. 8	Pittsburg, Fifth Annual Show, Duquesne Garden. First Week, Pleasure Cars; Second Week, Commercial Trucks. Automobile Dealers' Association of Pittsburg, Inc.
Mar. 18-25	Montreal, Can., Automobile and Motor Boat Show, Drill Hall, Automobile and Aero Club of Canada.
Mar. 20-26	Quincy, Ill., Mississippi Valley Show.

Races, Meets, Runs, Hill-Climbs, Etc.

Mar. 27-30	Jacksonville, Fla., Beach Races, Jacksonville Motor Club.
April 29	Guttenberg, N. J., Track Races.
April 8-9	Los Angeles, Cal., Twenty-four Hour Track Race, Los Angeles Motordrome.
Date indefinite	Oakland, Cal., Track Races, Oakland Motordrome.
Date indefinite	Shreveport, La., Track Races.
April 29	Philadelphia-Atlantic City Roadability Run, Quaker City Motor Club.
Mar. 12	Los Angeles, Cal., Track Match Race, Los Angeles Motordrome.

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TRANSPORTATION is becoming the paramount issue in this country, and the United States Army which is being massed on the Mexican frontier is proving every minute that the Quartermaster's Department would be in a better position were the mules turned out to grass, leaving it for freight automobiles to do the work, and according to information that is being segregated the Quartermaster's Department is now trying to get the Southern Pacific Railroad Company to place its trains at the disposal of the department, which is a practical admission that the animal transports are inadequate for the intended purpose. This clipping from the New York *Times* of March 15 states the position of the Quartermaster's Department with sufficient clearness:

> Capt. Normayle, Depot Quartermaster here, and the Southern Pacific Railroad are at outs over the handling of army freight. The trouble became acute today when the Depot Quartermaster threatened to abandon the army yards on the Southern Pacific tracks.
>
> According to Capt. Normayle, the big Harriman road has declined to switch freight from the International & Great Northern tracks to the army depot near the encampment. This makes it necessary to send the supply wagons four miles for the International and Great Northern freight. There are several cars of clothing and rations stalled on the International tracks to-night because the wagon method is not adequate to the demand.
>
> Southern Pacific officials state that their engines and tracks are being used to their fullest capacity by their own work and that to attempt more would bring about a congestion of the yards.
>
> This view is not shared by the Depot Quartermaster, but the railroad quotes a ruling of the Inter-State Commerce Commission in support of their position.

OPPOSITION to the automobile business on the ground that it was an economic malefactor came thick and fast a few months ago, and associations of bankers all over the country were tightening up on their purse-strings and shaking their wise heads on each occasion when the captains of the automobile industry made applications for money with which to carry their business over the hard spots. That bankers are looking through a different pair of spectacles is the gist of the lead story in THE AUTOMOBILE this week and it proves conclusively that the principal bankers in America, including heads of the great financial institutions in New York City, are ready to put their time and their money at the disposal of America's fourth industry. Merit is bound to win in the long run; truth is the foundation upon which investments must be made if returns are to be sure, and the conservative financiers whose names are being linked to the automobile business at the present time is proof positive of the fact that there are two types of gilt-edged investments in America to-day, the first of which is represented by government bonds, and the second investment represents that of the automobile.

* * *

COST of the operation of an automobile of the pleasure type in the service of the average man will be relatively high if the man disregards all the reasonable requirements and ignores the whole subject, abandoning himself to the pleasures of touring. The automobilists who are perfectly satisfied with the service they are receiving, and who experience a degree of pleasure that is lasting, keep accurate accounts of the cost incurred, thus curbing themselves in the directions that represent undue extravagance. They are placed in a position of advantage in certain particulars when they know what it costs to deprive themselves of proper facilities, as for illustration, if their tire bills are too high they are enabled to make an investment in perhaps a vulcanizer, or a power pump, and a gauge for measuring the tire pressure is suggested to them as a fitting instrument to use. But it would be useless for an automobilist to purchase all these things were he to disregard the keeping of cost, for he would then take account of the additions to his investment without knowing whether or not the proper savings might result. The great question is to ascertain the need by the gathering of statistics and the keeping of cost, and to act with some judgment, based upon a definite understanding of the requirement.

* * *

SPRING FEVER is a disorder that overtakes every healthy American citizen, and it comes with the sunshine and the drying up of the roads after a protracted season of snow and a disorderly array of the elements. A considerable number of those who have taken kindly to the automobile place their cars out of commission at the approach of severe cold weather, and in a state of absent-mindedness they abandon the whole project for a time. Some of these automobilists put their cars through a course of "sprouts" before retiring them, and when they are overtaken by the desires of springtime they have nothing to do but to crank up and be off. The laggards among automobilists leaving their repair work on the long finger too often, deferring the evil day until it is too late.

News Section

Happenings of the Week in Various Parts of the Country As Gathered By the Eighty-Five Special Writers and Correspondents of "The Automobile"

Wyckoff, Church & Partridge Break Away from the F. B. Stearns Company, Reorganize into Wyckoff, Church & Partridge, Incorporated, Absorb the W. A. Wood Manufacturing Company, of Kingston, N. Y., and Will Handle the Commer Truck and Manufacture Vaughn Car—The F. B. Stearns Company Opens a New York Branch and Will Centralize its Service Department—Croxton Motor Company, Royal Tourist Car Company and the Acme Veneer Body Company Merge into the Consolidated Motor Car Company—Other News.

Croxton and Royal Tourist Taken Over

JOINING the recently reorganized Croxton Motor Co., the Royal Tourist Car Co. and the Acme Veneer Body Co., the second step in the career of the Consolidated Motor Car Co., of Cleveland, O., was taken last Saturday when officers of the new automobile concern were elected and the project was formally launched.

The Consolidated Motor Car Co. was formed a short time ago with a capitalization of $4,000,000, half of which is preferred stock. Its object was to acquire other going automobile companies as a holding company and to act as selling agent for them. The Croxton and Royal Tourist companies were the first properties to be dealt with and the control of both has passed to the holding company. The corporate existence of the Croxton and Royal Tourist companies will be maintained as heretofore, as will also those of other properties that may be acquired in the future.

Officers of the Consolidated were elected on Saturday as follows: H. A. Croxton, president and general manager; K. F. Gill, first vice-president; J. P. Stoltz, second vice-president; K. F. Shurmer, treasurer; W. D. Forsythe, secretary. Directors: Henry A. Grube (N. Y.), A. H. Bedell, F. C. Caine and H. N. Hill of Cleveland. C. W. Fuller of Cleveland is general counsel.

Mr. Croxton is president and general manager of the Croxton Co.; Mr. Gill is a building contractor of Cleveland; Mr. Stoltz is vice-president and Eastern distributor of the Croxton cars; Mr. Shurmer is treasurer of the Royal Tourist and was formerly president of the Consolidated.

It was also announced on Tuesday that the Acme Veneer Body Co. of Rahway, N. J., had been acquired and would be operated in conjunction with the other plants.

Mr. Stoltz in discussing the plans of the company said: "There will be no changes in the operation of either of the companies that figure in the consolidation. The corporate identity of both will remain as it has been.

"A large percentage of the Croxton output has been taxicabs, but a full line of pleasure cars and two types of trucks have been manufactured. The Royal Tourist company has been before the public for many years with its well-known line. Both the Croxton and Royal Tourist will be presented in roadsters and touring cars, torpedoes and closed cars."

The financing of the company's projects has been undertaken by a prominent banking house of New York.

It is understood that the Acme Veneer Body Co. will not be limited to building bodies for the cars of the affiliated companies.

Among the immediate economies that will result from the consolidation are the savings due to the combination of the branch houses and local agencies in various parts of the country. Mr. Stoltz announced that the present expensive quarters of the Royal Tourist Co., in New York, would be abandoned and that the show and salesrooms of that company would be removed to the present location of the Croxton Motor Co. These quarters will be greatly enlarged and improved to take care of the additions.

Stearns Company's New York Branch

To handle its own product in New York, the F. B. Stearns Co., of New York, a factory branch of the F. B. Stearns Co., of Cleveland, O., has been incorporated and a commodious show room and sales department was opened in New York Wednesday at Fifty-seventh street and Broadway. The new corporation not only handles all sales of the Stearns product in this territory but includes the service department which was inaugurated early this year. This latter has been enlarged and preparations are under way to improve it materially.

Four models of the stock car of the company will be shown in the sales department together with a stripped and polished chassis, sectioned to illustrate the working of the car in detail.

It is said that the present quarters will be enlarged in the immediate future and plans are being made to acquire sites for branches of the service department as they may be required.

The head of the metropolitan branch is W. Arthur Lesser who has been identified with the selling of Stearns cars in New York for several years. Mr. Lesser will have charge of both departments of the branch house. He will be assisted by Frank W. Post, Jr., C. A. Ackerman and T. Mackenzie Alexander, all of whom are familiar with New York methods from their former connections with the automobile trade.

A feature will be made of the completeness and variety of the line of parts carried in stock.

A group of prominent officials of the Stearns Co. were present at the opening of the new branch. Among them were: Roy F. York, vice-president; Edwin McEwen, secretary and treasurer and Henry H. Hower, advertising manager.

It is the intention of the company to make an aggressive selling campaign, coupled with an earnest effort to take care of customers in the most modern fashion by means of the service department.

New York Dealers Elect Officers

John F. Plummer of the Locomobile Co. of America was chosen president of the Licensed Automobile Dealers' Association of the City of New York at the last regular meeting of that body. Mr. Plummer succeeds M. J. Budlong. The other officers chosen were: Carl H. Page of the Chalmers, vice-president, and Charles P. Skinner of the Mitchell, secretary and treasurer.

'Frisco Motor Club Stages Fine Show

SAN FRANCISCO, CAL., March 13—San Francisco's fourth annual automobile show closed Saturday night at Pavilion Rink. The show was given under the auspices of the San Francisco Motor Club. Opening night was March 4. Thirty different makes of pleasure cars are on display and ten makes of commercial vehicles. These numbers include gasoline, electric and steam cars.

The promotion of this show occasioned a clash between the two factions that at present predominate on the local Automobile Row. The Dealers' Association, which includes a number of the longest established agencies in San Francisco, declared itself opposed to holding the show and in consequence advertised through the local press that the firms therein represented would participate in no automobile show this season. The leading "independent" firms, however, were strongly in favor of the show and especially those who had cars which had but recently invaded the local market. The contest resulted in the association together with a few "outside" recruits refusing to exhibit. The differences arising in no way involved the question of licensed or unlicensed cars.

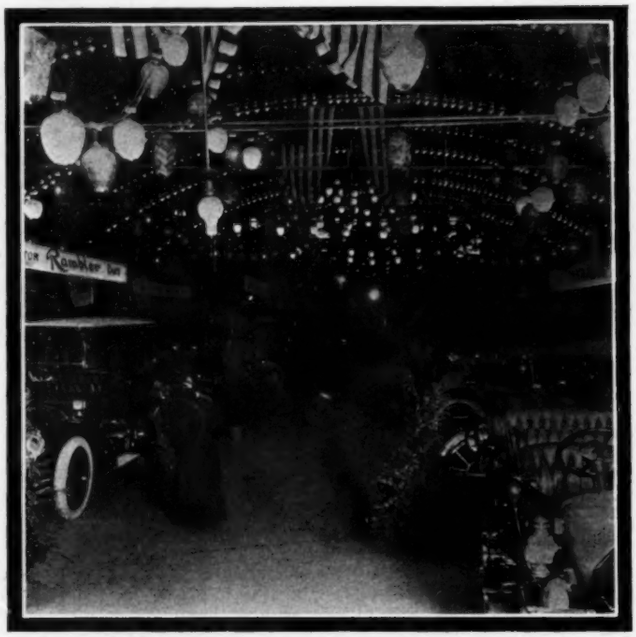
In spite of this opposition and the consequent limited number of exhibitors the show has developed into one of the prettiest and most successful ever held on the Pacific Coast. It has, as a natural result of the preliminary contest, become essentially a display of cars new to this territory.

The big pavilion is decorated after a unique flag scheme in which rich folds of multi-colored flags and pennants combine with myriad electric lights covered with Japanese lanterns to give the hall's interior an elegant oriental aspect. Paul Steindorff's band furnished the music.

The complete list of cars in the show with their exhibiting agencies is as follows:

PLEASURE VEHICLES

Speedwell—Speedwell Motor Car Co. of California.
McFarlan "Six"—Consolidated Vehicle Co.
Crow-Elkhart—Consolidated Vehicle Co.
Auburn—Auburn Motor Car Co.
Broc Electric—Baker & Hamilton.
White—The White Company.
Alco—Middletown Motor Car Co.
Haynes—Haynes Auto Sales Co.
American—American Motors Co.
Bailey Electric—Nestor Electrical Vehicle Co.
Autocar—W. C. Morris.
Elmore—A. J. Smith
Croxton—A. B. Costigan Motor Co.
Nance "Six"—A. B. Costigan Motor Co.
Stoddard-Dayton—Stoddard-Dayton Motor Co.
S. G. V.—E. Stewart & Co.
Crawford—E. Stewart & Co.



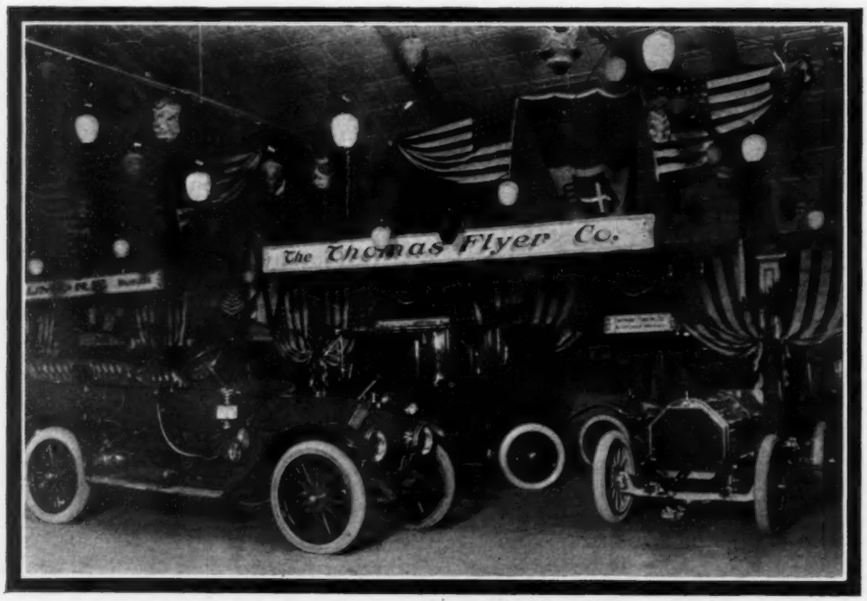
Giving an idea of the tasty decorations at the San Francisco show, with the Rambler and Cartercar to the left, and the American and White to the right

Amplex—American Simplex Co.
Matheson—Matheson Sales Co.
Brush—Brush Runabout Agency.
Imperial—Imperial Auto Co.
Cartercar—Cartercar Auto Co.
Premier—Cartercar Auto Co.
Fiat—Pacific Coast Motor Car Co.
Rambler—Frank R. Fageol.
Mercer—Mercer Auto Co.
Corbin—Corbin Automobile Agency.
Palmer-Singer—Wagner Motor Car Co.
Glide—Goode-Chinn Motor Co.

COMMERCIAL VEHICLES

White—The White Agency.
Alco—Middleton Motor Car Co.
Lansden Electric Truck—Nestor Electric Vehicle Co.
Autocar—W. C. Morris.
Stoddard-Dayton — Stoddard-Dayton Motor Co.
Hart-Kraft—E. Stewart & Co.
Brush—Brush Runabout Agency.
Avery—Babb Carter Co.
Cartercar—Cartercar Auto Co.
Gramm—Kleiber & Co.

In addition to this list there was also a large display of accessories.



View of the Thomas Flyer exhibit at the 'Frisco show, with the Elmore and McFarlan in the background

Newark's Everitt Agency

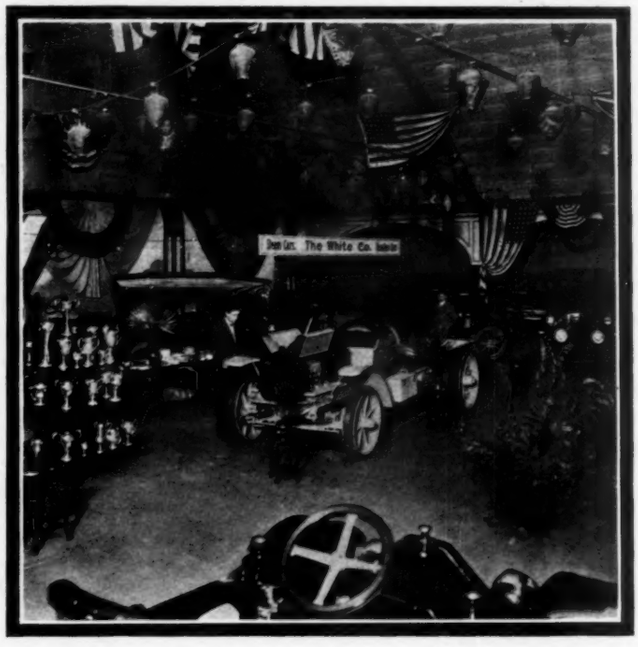
DETROIT, March 13—The Metzger Motor Car Company, of Detroit, manufacturers of the "Everitt 30," announce the appointment of Charles Calvert, a well-known figure in automobile circles, as factory representative in Newark, N. J.

During the past two years he has been the general territorial representative for the Winton Company, with headquarters in Indianapolis, Ind.

Syracuse Exhibition Beautiful and Busy

SYRACUSE, N. Y., Mar. 14—Just an even 100 cars shown by 54 exhibitors, together with a fine line of accessory and parts exhibits make up the offering of the third annual show held by the Syracuse Automobile Dealers' Association this week in the State Armory.

When the show opened this evening it found at the doors a



One of the most effective exhibits at the 'Frisco show was that of the White Company, including steam and gasoline pleasure and business vehicles

big crowd and within the hour it was an actual hardship to work through the thronged aisles. Syracuse this year has succeeded in making a gorgeous show. The ceilings and walls are draped in gold and white. White trellis works divide the spaces in such shape as to give the impression of a fairy summer garden. Living vines are interwoven in the trellis work and cut flowers are found at the tops in profusion. Of course the ceilings are festooned with lights and big chandeliers.

This show like the national events reflects the trend of the day in the automobile world. Only four cars are shown without foredoors and where there were only two or three makes of trucks shown last year, there are ten or eleven this week, ten in place at the opening and an extra one on the way.

F. H. Aubeuf & Co., of Oneida, are exhibiting an entirely new accessory in their rotary lamp brackets. They have been in the process of manufacture for some time, but this is the first show to see them. Several of the makes of cars are being exhibited at a Syracuse show for the first time, among which are the Amplex, Sampson trucks, Sanbert trucks, Moon, McIntyre, and Case. In addition to these features Syracuse has started an innovation in local show circles by installing a real restaurant in the basement where everything to be found in an up-to-date café may be procured. A full branch exchange telephone board together with loops from both telegraph companies are in evidence and one of the typewriter companies has installed a free typewriter service.

The cars shown, with the names of the exhibitors, follow: Amplex, Kerr-Doane Motor Co.; Baker Electric, Willis Motor Car Co.; Brush, Kane & Roach; Buick, Strait & Shaw; Cadillac, Genesee Motor Car Co.; Case, Case Threshing Machine Co.; Chalmers, J. H. Valentine Co.; Chase, Chase Motor Car Co.; Columbia, United Motors Co.; E-M-F, Central City Motor Car Co.; Everitt, Rambler, James Auto Co.; Flanders, Central City Motor Car Co.; Ford, Syracuse Motor Car Co.; Franklin, Franklin Automobile Co.; Herreshoff, Clinton Automobile Co.; Hudson, James Auto Co.; Hupmobile, Fred A. Marshall; McIntyre, Syracuse McIntyre Co.; Matheson, W. K. Smith Co.; Maxwell, United Motors Co.; Mitchell, J. L. Youmans; Moon, Arthur Virginia; Moyer, H. A. Moyer; National, W. King Smith Co.; Rapid Truck, Willis Motor Car Co.; Oldsmobile, Willis Motor Car Co.; Overland, Overland-Syracuse Co.; Packard, C. A. Benjamin, Inc.; Paterson, Ross L. King; Peerless, Theodore A. Young; Pullman, Syracuse Motor Car Co.; Regal, Syracuse Regal Co.; Reo, Kerr-Doane Motor Co.; Sampson Truck, United Motor Syracuse Co.; Selden, Willis Motor Car Co.; Simplex, W. King Smith Co.; Speedwell, Clinton Automobile Co.; Stearns, Clinton Automobile Co.; Stevens-Duryea, James Auto Co.; Velie, Kerr-Doane Motor Co.; White, Clinton Automobile Co.; Whiting, F. L. Durbin; Winton, Kerr-Doane Motor Co.

All the accessories are in the basement as follows: American Multigraph Co., copying machines; F. H. Aubeuf Co., rotating lamp brackets; Dyneto Electric Co., charging and lighting outfits; Jones & Pimm, tops, etc.; Meyers Brothers, ivory novelties; Mills Oil Co., oils and greases; J. D. Quinlan, tires and accessories; J. A. Seitz, Monogram oils and accessories; Standard Oil Co.; Syracuse Rubber Co., accessories and tires; Syracuse Storage Battery Co.; Tiffany Sales Co., folding typewriters; A. G. Williams, tires; E. Q. Williams, electric accessories and plugs.

Where the Stoddard-Dayton held forth at the 'Frisco show, with the Alco, Palmer & Singer, Broc Electric and Croxton in the background

W. C. & P. Reorganizing Without Stearns

Wyckoff, Church & Partridge and W. A. Wood Automobile Manufacturing Company Absorbed by Wyckoff, Church & Partridge (Inc.). To Handle Commer Truck and Manufacture Vaughn Pleasure Automobile

HOSTS of old timers in the automobile business would be inclined to regard the establishment of Wyckoff, Church & Partridge at the corner of Broadway and Fifty-sixth street, New York City, as a permanent institution, marking a particular part of "Automobile Row" indelibly, and in announcing the absorption of this company together with the W. A. Wood Automobile Manufacturing Company, of Kingston, N. Y., it remains to be said that the outward appearance of this particular zone of "Automobile Row" will remain as heretofore. The changes that are being instituted are in view of a situation that has been brewing for some time, resulting in the withdrawal, by mutual consent, of the agency connection that has heretofore existed between the F. B. Stearns Company, of Cleveland, Ohio, manufacturer of the Stearns automobile, and Wyckoff, Church & Partridge.

A new corporation, Wyckoff, Church & Partridge (Inc.) has been organized for the purpose of taking over the W. A. Wood Automobile Manufacturing Company, builder of the new Vaughn pleasure type of automobile, and with this enterprise has been combined the American licensee of a well-known make of English commercial car known as the Commer truck. This new enterprise represents a reorganization of the old firm of Wyckoff, Church & Partridge, and it is proposed to develop and build the 30-horsepower type of pleasure automobile as designed by Guy Vaughn, the "try-out" car of which model was completed at the Wood plant perhaps a year ago, and, after a strenuous test which has extended all over the East since that time, was refined, resulting in the new standardized model.

The general appearance of the Wood plant at Kingston was picked up by a camera man attached to the staff of THE AUTOMOBILE on March 13, and is reproduced here as Fig. 1, and a bird's-eye view in fore-shortened perspective is presented in Fig. 2. This plant is situated alongside of the West Shore Railroad at Kingston, N. Y., and three sidings branch out from the railway line, connecting with the various parts of the building in such a way as to enable the railway company to shunt freight cars (a) to the receiving room, (b) to the shipping department and (c) to the yard. The main building is 357 feet long by 152 feet wide, of slow-burning construction from the insurance point of view, with internal arrangements that are in accord with the most approved plan of automobile building, permitting of the movement of raw material into the plant, distributing the same to the machine tools as they are located on either side of the inspection rooms, with facilities whereby the chief inspector and a corps of trained assistants will be in a position to inspect each operation of each piece so quickly and so precisely that any departure from the fixed limits of tolerance of the plant will be discovered without incurring the cost of additional work as against the idea of finishing the parts first and inspecting them afterward, perhaps to find that they are below standard and at a cost that would be greatly in excess of necessity under the conditions as shown in the plan of this establishment.

In deciding to go into the building of automobiles, Wyckoff, Church & Partridge (Inc.) are taking advantage of their many years of experience on the operating side of the automobile situation, realizing that when a part is made, if it proves to be below standard, the temptation to use it anyway is very great. Entering the business with the idea of building automobiles complete, the plan includes a tool room along approved lines, which is located at the immediate left of the main building upon entering from the railway, and adjoining the tool room is a separate and completely organized experimental department, wherein it is proposed to do the advanced experimental work without permitting it to interfere with the standardized operations in the plant proper.

FIG. 1—PLANT OF THE W. A. WOOD AUTOMOBILE MANUFACTURING COMPANY AT KINGSTON, N. Y.

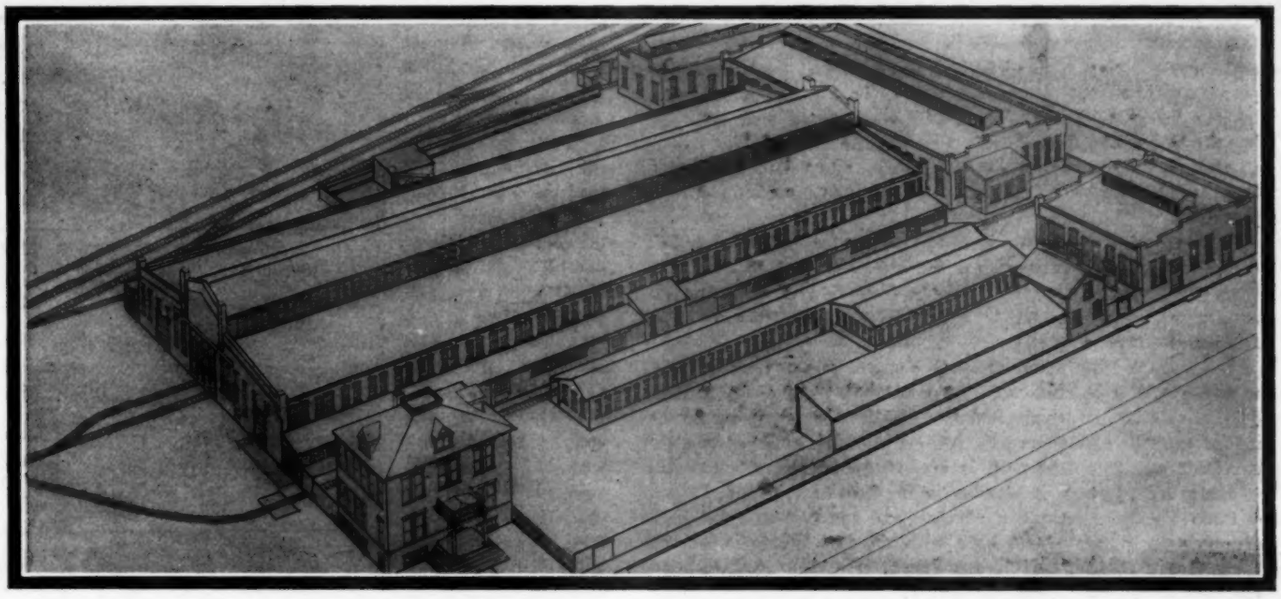


FIG. 2—BIRD'S-EYE VIEW IN FORESHORTENED PERSPECTIVE OF THE WOOD PLANT

Further down in the building and to the left the storeroom is placed, this being convenient to the railroad and centrally situated with respect to the delivery of stock and parts to the shop. Beyond the storeroom on the same side of the building a space is set aside for the assembly of small parts, making up the units which after a try-out under standardized conditions are to be aggregated in the main assembling department where the automobiles will be put together prior to the final chassis-testing operation.

The building is contrived with a center bay, which is now being devoted to the erection of the Guy Vaughn chassis and to the putting together of the Commer cars as they are received from the home plant in England. It is the aim of the company at Kingston to take the Commer trucks as they are imported and by a fixed method of procedure put them through an inspection process, testing the units and the final assembly, thereby making it possible to guarantee the performance of these freight automobiles in the service to which they may be devoted.

Passing through the main building, after going by the commodious office building, as shown in the photograph, the visitor is confronted by a power house on the left, and a laterally disposed building with an extension which will be an important part of the manufacturing establishment under the new plan. The power house is equipped with an adequate power plant, including compressed-air machinery and a supernumerary motor to take the work in the event of a mishap to the main source of power. The lateral building is to be devoted to the assembling of motors, heat-treatment work, a commodious forge, including steam ham-

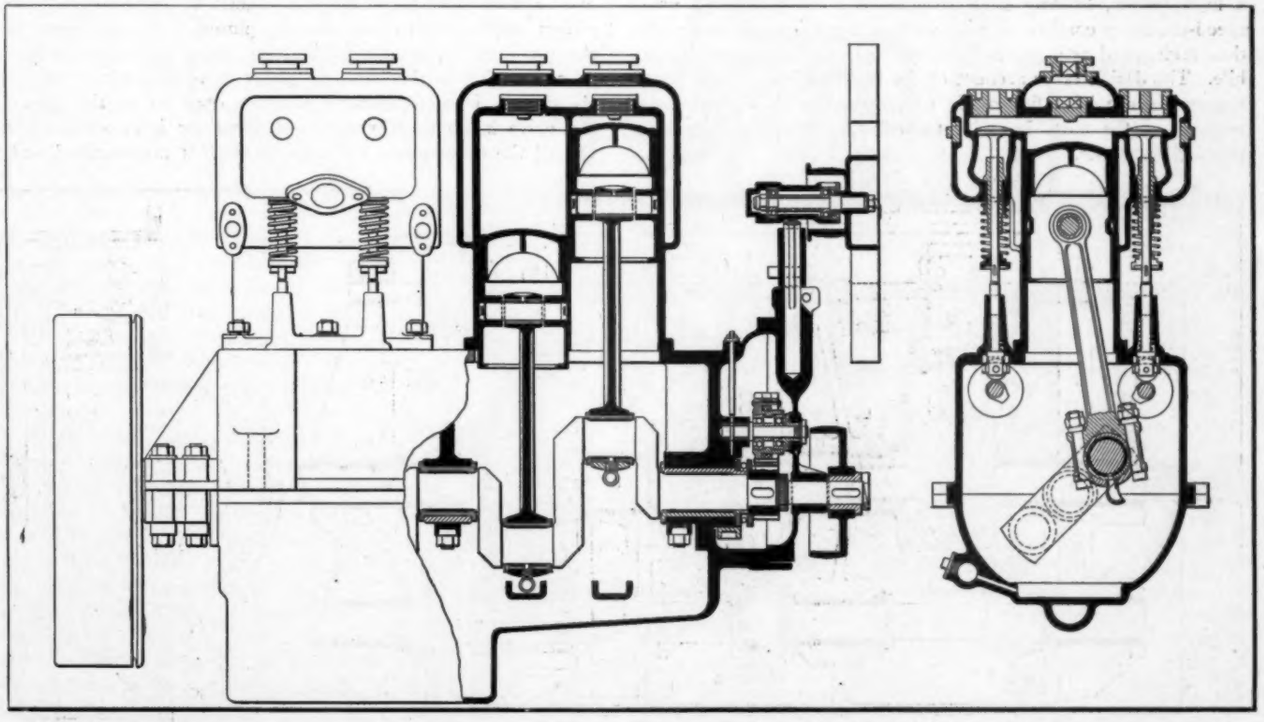


Fig. 3—Sectional view of the Commer motor, showing heavy crankshaft, long bearings and independent lubrication system

mers, and a buffing and finishing department. It is contemplated that a casting department will be established in the near future, and a pressed steel division is also to be added. Under the comprehensive plan that is being put into force, the final chassis testing and tuning up processes will take place in the large shop facing the main road, it being the idea that the automobiles will be given a road test of from 100 to 150 miles, and it is convenient to run the cars in and off the road, utilizing this building for the purpose.

Geographically, Kingston is in the heart of a skilled labor center and the accommodations for the artisans are in keeping with their needs. It is a high, well-drained country, free from malarial trouble, and close enough to the metropolitan district to serve any utility purpose.

Pending the time when the Guy Vaughn pleasure automobiles will be available to customers, there is much to do in the making of adequate preparations, and the success that is being experienced with the Commer truck, following its six or seven years of excellent attainment abroad, is enough to absorb the activities of the present large organization of the firm of Wyckoff, Church & Partridge, Inc., making it necessary to add to and extend this organization sufficiently to cope with the new demands, so that Kingston is about to witness a very active campaign with the automobile as the center of attraction.

Presenting the Mechanical Features of the Commer Truck, Showing that Thought Expended on the Mechanisms Reduces the Need of Gray Matter in the Head of the Driver for the Most Part

From a mechanical point of view, the chassis of the Commer truck is an evolution along conservative and tried-out lines, and the motor, Fig. 3, which is shown in part section, is of the four-cylinder, four-cycle, water-cooled type with substantial torsion members, including a heavily designed crankshaft, long bearings and means for lubrication that are independent of the skill of the driver. The cylinders are of the T-head type, bringing the intake and exhaust to opposite sides. The valves are designed for truck work, provided with separate guides, and a characteristic of the motor under service conditions is such as to afford a high torque, holding to a substantially constant level under speed-changing conditions, thus trading for draw-bar pull rather than high speed as it would be demanded in a passenger automobile. The design takes account of the fact that high torque necessitates the use of a fine grade of material, and well-calculated sections of the parts in order to withstand the relatively large twisting moments.

The peculiar feature of the Commer truck outside of the substantially designed motor in a well-contrived chassis lies in the design of the transmission gear, which, instead of the conventional form of sliding gears, is provided with a system of jaw clutches with cam operators so contrived that the driver of the truck may slide from one speed to another without exercising skill, due to the fact that the cam operators are endowed with facility of automatically making the change from one speed to another, responding to the pressure exerted by the driver upon the lever of the control. In this system, as it has been worked out, it would seem as if the designer transferred his brains to the transmission gear, thus making it unnecessary for the driver of the truck to do any thinking beyond taking the initiative. This is a happy situation in quite a number of respects, due to the fact that truckmen, however good they are at negotiating congested districts, do not rank high as machinists or philosophers.

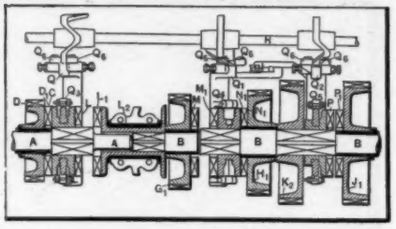


Fig. 4—Arrangement of a main shaft and position of clutches on the first speed gear

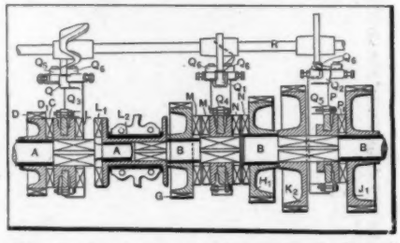


Fig. 5—Arrangement of a main shaft and position of clutches on second speed gear

Fig. 9 shows a four-speed gear box with the gear wheels in mesh and the jaw clutches and cam operators. Fig. 6 shows the gear box in section. The power is transmitted from the engine to the mainshaft A, which has a long bearing at the front and a spigot bearing in sleeve L2. The gear wheel D, on which is cut the dogs D1, runs free on the shaft A. D is in constant mesh with the gear wheel E on the countershaft F, and to this latter are fixed G, third-speed driving pinion; H, second-speed driving pinion, and J, first-speed driving pinion. In most gear boxes the lay shaft is in constant motion, using up a certain amount of power; but in this case the direct drive is obtained by sliding the dogs L into engagement with the dogs L1 on the sleeve L2, the drive being thereby removed from the intermediary pinion. On all the other gears the dogs D and D1 are engaged and the

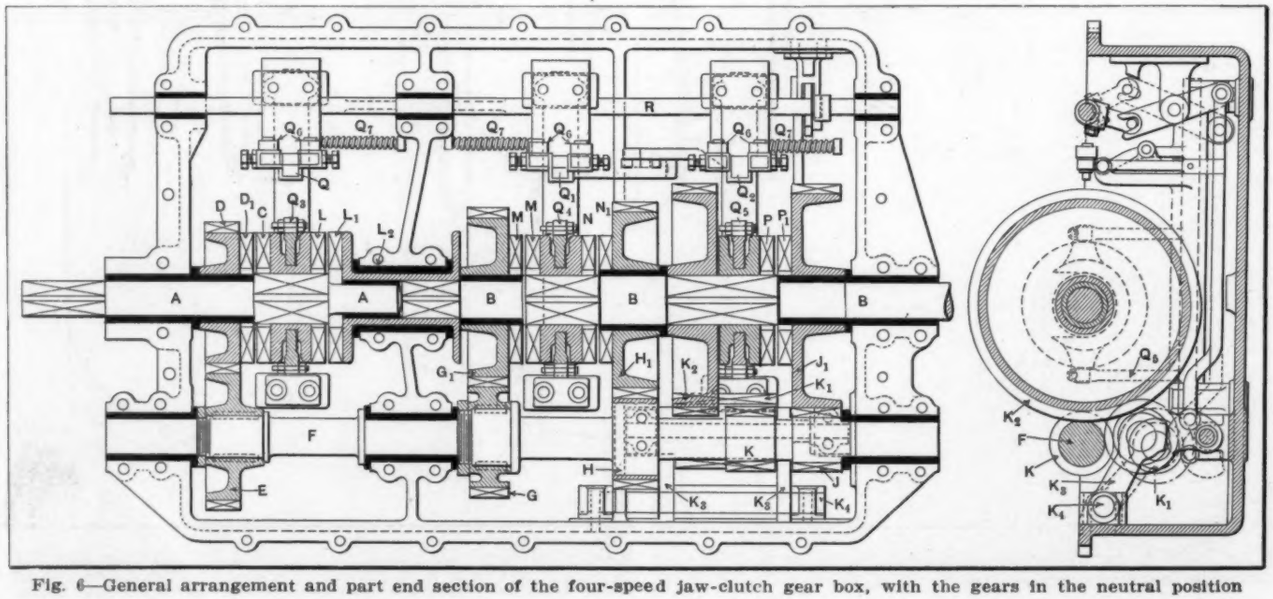


Fig. 6—General arrangement and part end section of the four-speed jaw-clutch gear box, with the gears in the neutral position

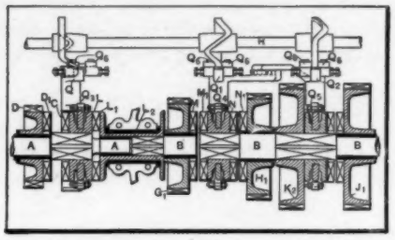


Fig. 7—Arrangement of gear and clutches on the direct drive

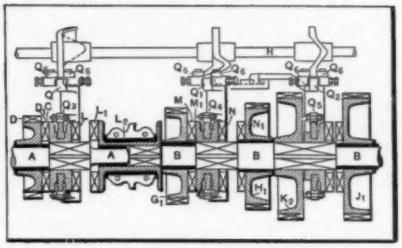


Fig. 8—Arrangement of a main shaft and position of clutches on third speed gear

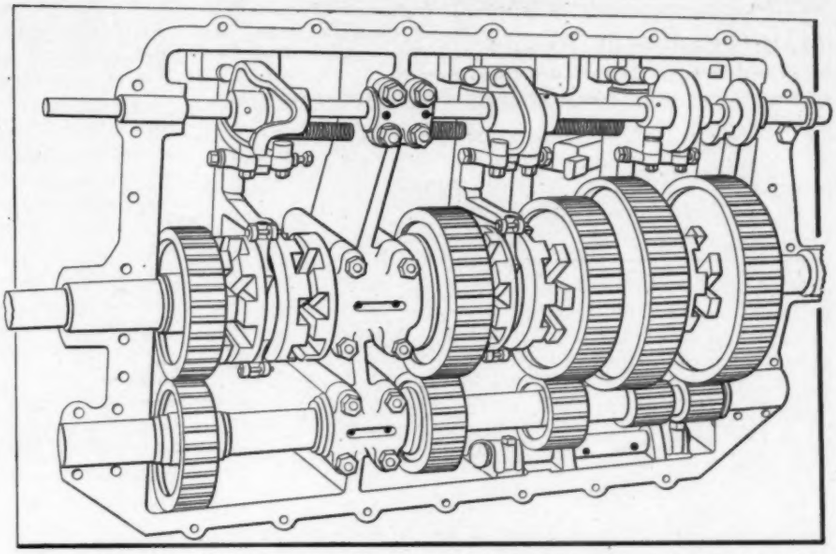


Fig. 9—Plan view of the four-speed type jaw-clutch transmission, showing the dog clutches and cam operating mechanism

power is transmitted through D to E and then G to M for third speed, H to H1 for second speed, and J to J1 for the first speed. The feature of this transmission is that it is practically automatic, although the driver as a preliminary must move the gear lever, provided such movement does not disengage one gear and engage another when the first is under load—that is, under normal conditions of running—but the change is made by the springs provided, Q7, when the driver so desires. With the top speed in action it is possible to drive for an unlimited distance with the gear lever in the next lower speed notch, provided the strain of drive is not removed from the top gear by depressing the clutch pedal or closing the throttle. The engagement of the various clutches is made by the rotation of the camshaft R. The driving and driven faces of all the dog clutches are undercut so that when the engine is driving it would require great force to disengage them. The motion of the cams to the actuating levers Q, Q1, Q2, for swinging forks Q3, Q4, Q5, respectively, which are the dog clutch strikers, is taken up in the springs Q7, so that no change takes place while the strain of the drive is still passing through the pair in use. When the strain of the drive is removed by declutching, the spring under compression throws one set out and another into mesh; closing the throttle partially removes the drive and allows the springs to act. The advantages of this type of change make it impossible to miss a gear, and while climbing a hill all that has to be done is to place the lever in the next lower notch before the change is necessary and at the required moment by the disengagement of the clutch the change will take place, and letting it in again softly the lower drive is taken up without delay and shock. It is possible to pass from the direct drive to the low gear without passing through the other gears, such a movement being necessitated by traffic stops.

The reverse is brought into operation by bringing the intermediary pinion K1 into engagement with K and K2, which is fast on the shaft B, by the reverse snail cam K3.

For engagement and disengagement a cushion drive is placed immediately behind the gearbox, which allows sufficient hesitation to accomplish change of speed without noise. Figs. 4, 5, 7 and 8 show the positions of the dogs on different speeds. Fig. 10 shows the differential.

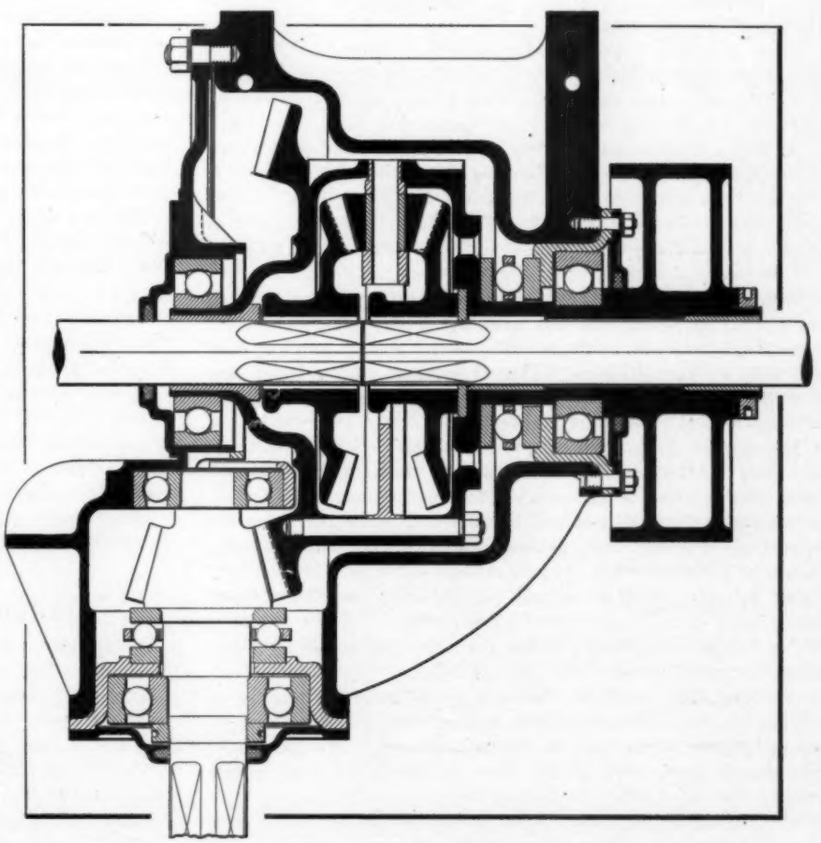


Fig. 10—Sectional plan view of the Commer car differential, showing the method of supporting the driving pinion and the cross jackshafts

Maintenance of Roads

Proper Drainage Helps Out Marvelously, but a Good Roof Is Absolutely Necessary to Bring Best Results

TRYING to get away from the fact that the automobile is having a large influence upon the methods in vogue in the building of roads is a process that is becoming stale, and the more advanced road-builders now admit that the schemes of the past were too primitive to be tolerated any longer. It is a terrible waste of the public's funds to go on in the old way, just building roads, not taking into account the fact that they have to be maintained. But the situation is rapidly assuming better proportions; the specimen roads that the United States Department of Agriculture, under the Office of Public Roads, is planning and placing at the disposal of commissioners of roads throughout the several States are having a salutary effect. It is being shown that it is better to maintain a road after it is made than it is to allow it to depreciate, thus requiring the replacement of the road within a few years.

There seem to be two points that, while they may be well understood, are not being attended to. It is understood, of course, that a road will not survive a single "thaw" unless it is properly under-drained. It is also understood that the top of the road should be impervious to water—*the roof should be tight.* No matter how good a road may be made it will not stay in that shape for any great length of time unless it is made water-tight.

Road builders do not agree about the details of construction, but, happily, they are overcoming their differences, and it is to be hoped that a standard will soon be fixed upon. Whether or not it will be better to top-treat the finished road or incorporate the binder into the road as it is being made is the point that has to be disposed of for all time. For the last six years the builders of roads have been experimenting with coal tar products for binding material and for top-dressing to prevent the road from blowing way.

There are quite a number of evidences of the probability that it is better to uniformly construct a water-proof road than it is to merely rely upon an occasional sprinkling of dust-preventing material. According to the experiments that have been made with "tarvia," which is a coal tar product, compounded to afford tenacity, viscosity and good binding properties, the better way would be to bind the whole structure and make it absolutely water-proof. In 1906, at Somerville, Mass., this material was tried out on a road, using the "penetration method," as follows:

This material was sprayed over the top layer of 1 1-4-inch broken stone at the rate of 1 1-2 gallons per square yard of surface. The binder was hot when sprayed. After the binder was sprayed pea stone was applied to form a layer and the road was then rolled until solid. This experiment afforded information that led to the conclusion that two coats of the binder should be used if best results are desired.

The method of construction, using binders of this character, according to the experimenters, depends upon the local conditions, and the road engineer should take cognizance of the results already accomplished and be guided to some extent by the experiences gained. As a general proposition a good road may be made as follows:

(a) Provide suitable drainage for the road—without this all plans fail.

(b) Lay a base course 4 inches thick, of "run of the crusher" product, ranging from 3-inch to 1-inch stone.

(c) When this course is filled and rolled as in the making of ordinary macadam road-building, spread upon it, to a depth of 1-2 inch, clean, sharp sand or gravel and spray with the binder of suitable consistency, at the rate of 1 gallon to the square yard.

(d) Put down the next course of broken stone, using sizes ranging between 3 and 1 inch.

(e) Roll to a thickness of 2 1-2 inches.

(f) This process is of great importance—with a steam roller, roll continuously until the gravel coated with the binder is drawn up between the stone, binding the top course firmly and forming a level, hard road.

(g) Put down, to a thickness as indicated by necessity, a layer of 3-4-inch broken stone, and sprinkle with a relatively viscous binder, making sure that all of the "chinks" are filled up and that the rolling operation, which should follow, will end in a hard, level road, free from loose material.

(h) Apply a final coat of binder of suitable consistency.

In the old way, it was found that the stone had to be of a quality to withstand internal friction. This friction is eliminated when the road is suitably bound and the load is taken by a sufficient amount of material to reduce wear to a point that suggests the advisability of preserving the integrity of the investment in this way.

Des Moines Show Pronounced Success

DES MOINES, IOWA, March 11—The second annual show of the Des Moines Automobile Dealers' Association closed here to-night. It was the greatest auto show ever held in Iowa. It was held at the Coliseum, which is the biggest hall in the State, and the building was crowded to such an extent that one or two exhibitors had to show in hotel lobbies.

Sixty-two makes of gasoline, four electric and seven commercial cars were shown and in all there were 153 complete cars and chassis exhibited. Both the main floor and the balcony of the Coliseum were used for display and the decorations were the finest ever seen here. The big show hall was turned into an Italian garden, the color scheme being gold, green and white. The booths were separated by lattice-work of green. Several hundred statues of Flying Mercury and Venus of Milo were featured in the decorations.

The attendance for the five days of the show was 25,000, much larger than that at the first show last year. There was a heavy attendance from out of the city and there were several hundred sub-agents from all over the State. The exhibitors were greatly surprised at the unusual number of sales made. According to reports made just before the show closed to-night 335 cars had been sold during the week. A large part of this number went to farmers. Many of the "big men" of the automobile world were here for the show and practically all factories had representatives in addition to their local men.

The cars shown here were as follows: Pleasure cars—Auburn, Abbott-Detroit, Buick, Cadillac, Case, Chalmers, Colby, Cole, Crow, Elkhart, Elmore, Empire, Everitt, E-M-F, Flanders, Falcar, Garford, Great Western, Hudson, Hupmobile, Inter-State, Jackson, Knox, Kisselkar, Locomobile, Maxwell, Marmon, Marion, National, Moline, Ohio, Oldsmobile, Overland, Winton, Apperson, Paterson, Pierce-Arrow, Rambler, Reo, Staver-Chicago, Westcott, Cutting, Spaulding, Cartercar, Packard, Firestone, Regal, Pope-Hartford, Mitchell, Stearns, Corbin, Stoddard-Dayton, Oakland, Velie, Van 22, Clark, Ford, Richmond, Krit, Imperial, Paige-Detroit, Zimmerman, Warren-Detroit.

Electrics—Baker, Columbus, Woods, Detroit.

Commercial—Avery, Kelly, Gramm, Dart, Buick, Sampson, Cartercar.

Dowse Resigns from G. & J.

INDIANAPOLIS, March 13—Byron C. Dowse, who for the past three and a half years has been president of the G. & J. Tire Company, of Indianapolis, tendered his resignation on March 10.

Mr. Dowse's connection with the G. & J. Tire Company has been one of long standing, dating back as far as 1899, when the Rubber Goods Manufacturing Company acquired the Indianapolis plant, and marketed tires made under G. & J. patents. Prior to this he was engaged for over four years as selling representative of the Gormully & Jeffery Mfg. Co., Chicago. For many years he was general representative of the company.

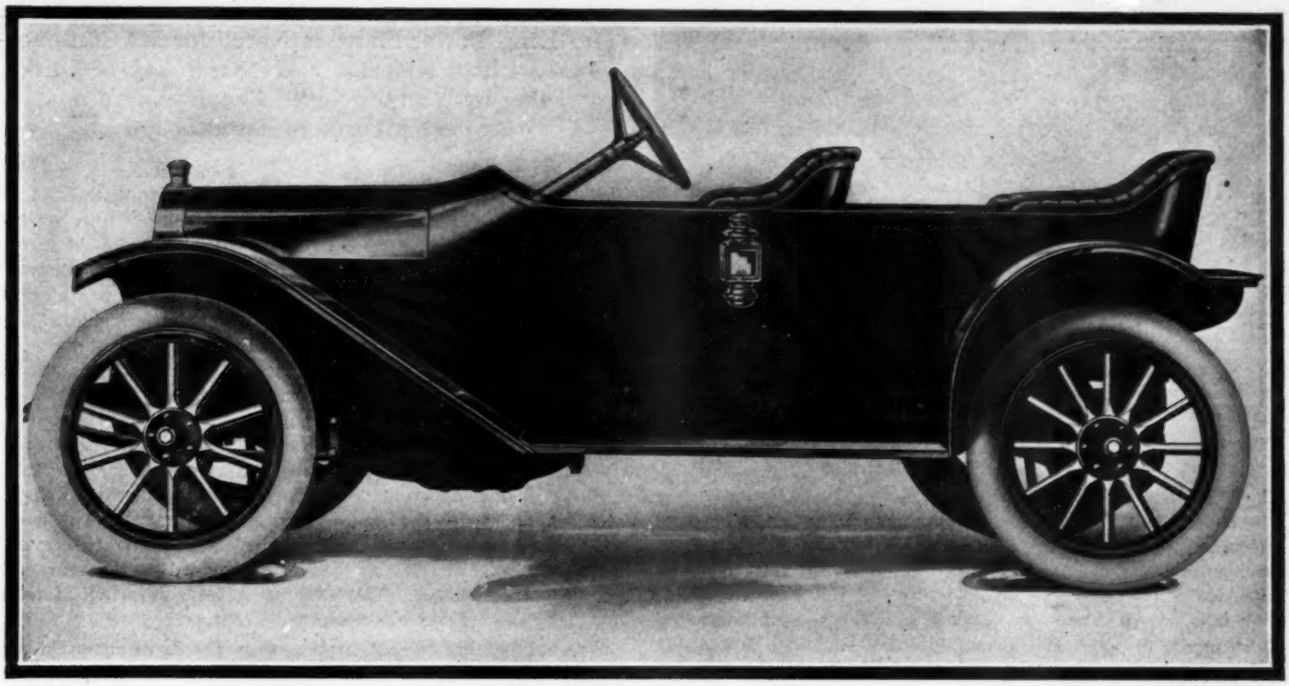


Fig. 1—Elevation of King Model "36" fore-door type of touring car, showing cowl, straight lines, smooth exterior and left-hand drive

First Appearance of King Car

Describing the Latest Effort of Charles B. King, Who Will Be Remembered as the Designer of the "Northern" Automobiles

PRESENTING model "36," the latest effort of Charles B. King in the automobile line, under the direction of the King Motor Car Co., of Detroit, Mich., which is about to make its appearance, the scheme of design as well as the plan of execution of this model will be apparent from an examination of the illustrations here afforded. The new automobile is unique in important particulars, and according to the information at hand, it was the designer's idea to reduce the number of functional members to the absolute minimum and to eliminate parts that cannot be regarded as essential to the good success of an automobile and the well being of the owner thereof.

Fig. 1 presents the car complete, it being of the fore-door type, with sweeping smooth sides. The driver's seat is almost centrally located between the axles, and an overhanging cowl takes an upward sweep, thus deflecting the air-currents above the driver's head. The center of gravity is low, which, together with a long wheelbase, and a novel form of spring suspension, are designed to impart the character of road performance that is in keeping with the aspirations of the automobilist of experience and acumen. The entrances to the tonneau are commodious, and considerable foot-room abounds therein, without detracting from the value of the rear seat.

The radiator is placed in the plane of the front axle, and the motor being of the block type with four cylinders, occupies so little room that the dash-line is not set so far back as to interfere with the arrangement for the excellence of accommodation. It will be necessary to examine Fig. 2 in order to obtain a clear idea of the working of the rear spring suspension, but in the finished product as shown in Fig. 1 the anchorage of the rear springs is against the face of the chassis frame, coming into view in the plane of the rear doors. Referring to Fig. 2 it will be seen that the spring is made up of a series of straight flat plates anchored at the front end with a fulcrum part of the way back, but the greater length from the fulcrum is in the shape of a cantilever terminating in an eye and a pin, which flexibly attaches the end of the spring to the rear axle. This cantilever suspension operates in the manner as shown by the dotted lines, and the degrees of flexibility of the cantilever spring are regulated by supplying the requisite number of flat plates, stepping them back by equal increments, the master plate being equal to the total length of the spring, and the supplementary plates being stepped back to afford the degrees of suppleness that accord with the designer's idea of the requisite riding qualities of the automobile on the road. An inspection of the illustration with a view to considering the vertical oscillations of the car would lead one to the conclusion that the cantilever extension of the spring is in the nature of a pendulum, and that the vertical bounce of the body will conform to the laws governing pendulum actions. Considering these laws, if the pendulum is relatively long the action will be relatively slow, and there is evidence of the designer having taken into account these pendulum characteristics since the cantilever spring is relatively long.

The wheelbase of the car is 115 inches, and of the total weight,

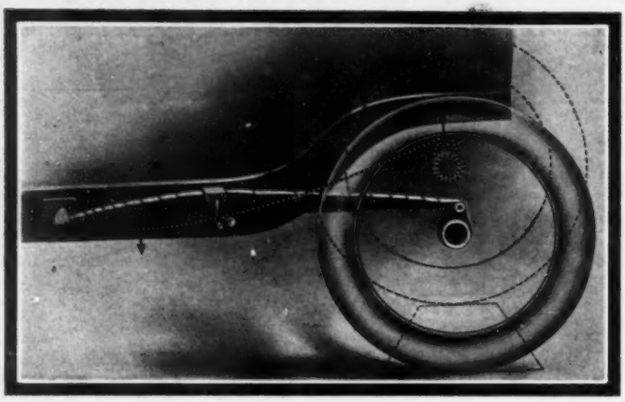


Fig. 2—Diagram of the cantilever spring suspension which is attached to the rear of the King Model "36" car

the major portion is below the suspension point of the body, and the body construction is of the minimum weight consistent with strength, allowing for a stable foundation for finish. The front springs are of the half-elliptic type, fixed at the front end and shackled at the back. To obtain an idea of the weight distribution it is only necessary to observe in Fig. 1 that the motor is horizontally disposed and swung low in the chassis frame. In like manner the transmission gear is below the swivel point, and a straight-line drive is one of the other perquisites of the plan. The connections from the motor, transmitting the power of the same, are designed for flexibility to counteract road effects, and the strength required to resist torsion is adequately interposed.

34x4 Inch Tires Are Used and Are Selected in View of the Lasting Qualities of This Size Harmonizing with the Spring Suspension Employed

Among the main features of the general design the front axle is described as of pressed steel of the channel type, re-inforced by drop-forgings, and the inclination is 70 degrees, it being the idea that this is the angle which will resolve into a closed couple of the road shocks. The rear axle is of the full floating type, fitted with Hyatt high-duty nickel steel bearings in combination with annular type ball bearings in conjunction with phosphor bronze supporters. The designer purposed relieving the driving shaft of the chassis oscillations, confining its function to its normal purpose. The axle shafts are 1 3-8 inches in diameter, squared at the differential extremities and fitted into broached holes in the differential suns. The hub ends are tapered.

Two sets of brakes are employed and suitable equalizers are introduced between the brake levers and the pedals. Both sets of brakes are operated by pedals on the floor. There is a locking ratchet on the emergency brake pedal. The service brake swings free, and remains in the released position unless pressure is put upon the pedal. Twelve-inch brake drums are employed, and clips are placed to prevent the brakes from dragging.

In the particulars that class as minor in the main, but which are of more than a little importance, as in the elimination of parts and the use of good material in the remaining members, it has been the aim of the designer in this example to establish a precedent. The general appearance of the chassis indicates that care has been exercised in this regard, and drop forgings are preferred.

The King Power Plant Is Noted for Its Compactness, Clean Exterior and Symmetry of Outline with an Enclosed Flywheel and a Special Form of Lubrication

The motor, the right side of which is shown in Fig. 3, is of the block type with enclosed flywheel and self-contained transmission gear system. The block casting encloses four water-cooled cylinders each with a bore of 3 3-16 inches, and a stroke of 5 1-8 inches. The company rating of this motor is 35 horsepower. The crankshaft is of stout section with two bearings 18 inches between centers. The valves are on the left side of the motor, but are enclosed as shown in Fig. 4. The carbureter is fastened by its manifold to the exterior of the motor as there indicated. An effort has been made to reduce friction losses in the transfer ports, for which purpose the valves are placed at an angle from the vertical, and the transfer ports are shortened as much as possible. In enclosing the valve mechanism there were two points uppermost, one of which has to do with silence, and the other with the exclusion of foreign matter. The half-time gear system includes a spiral drive. In order to prevent carbureter wheezing an air intake is provided at the rear end of the valve chamber. The exhaust transfer is provided with unusually large areas of openings.

The two-bearing crankshaft is 2 1-8 inches in diameter on the pins, and in order not to choke the motor at high speed, the valves are made 1 1-16 inches in diameter. Ignition includes the use of a magneto of the dual type installed in the manner as shown in Fig. 5. The magneto is driven by a cross-shaft taking power from a gear within the housing at the front involving the use of a spiral, catering to silence. The enclosed flywheel is used as an oil-pump, and the lubricant is lifted from the bottom of the wheel to an elevated point and slung into a trough through which it flows by gravity to the bearings to be lubricated, and thence away by suitably arranged conduits to the filtering point and back to the well again. This system of lubrication is automatic, and the bearings are profusely lubricated.

The transmission gear housing and the case for the flywheel are in one piece, fitting a circular extension of the motor case, and held in this relation by 12 through bolts. Power is transmitted from the motor through the flywheel to a clutch of the multiple disc type with all steel discs that are hardened and ground and run in oil. Since the clutch is between the flywheel and the transmission gear the customary use of cardan shaft is eliminated, and the power plant as a unit is somewhat reduced in length.

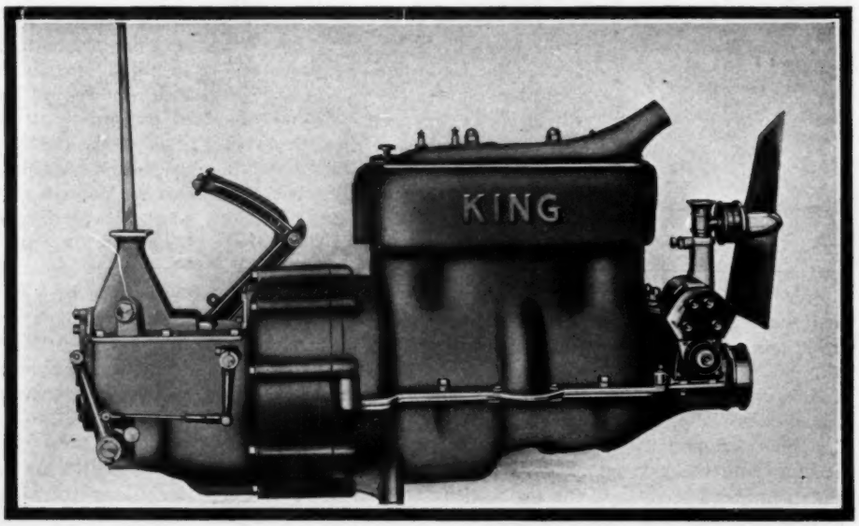


Fig. 3—Right side elevation of the King bloc motor, showing a power plant of the unit type with the flywheel enclosed

Three Speed Selective Transmission Contained in a Housing Back of the Flywheel Interprets the Speed of the Motor Regulating the Speed of the Car

The transmission gear, affording three forward speeds and reverse, being of the selective type is controlled by a lever which passes up substantially on the center line and terminates in a sphere in the manner as shown. The pedals are connected through suitable links and levers as indicated in Fig. 3, and more completely detailed in Fig. 4. It will be observed that hand-hole covers are provided at points of vantage, but care has been exercised to so locate them that the lubricating media will not eke out, nor is the automobilist required to exercise more than ordinary care in the placing of the covers to assure tightness.

The car, as it is proposed to place it at the disposal of the company's clientèle, will be fitted with a windshield, gas tank, gas lamps, tool kit and other customary equipment, at the price of $1,565.00. With ordinary oil-lamp equipment and horn, with a tool kit, and tire necessaire, the price is $1,350.00 The same power .plant and chassis is used in the several options, so that the roadster type will be delivered at a price of $1,465.00, and the lowest price named by the company is $1,250.00 for a roadster type with oil lamps, etc. The standard color for the new King product is dark blue with silver gray gear.

Cutting Car's Home Enlarged

JACKSON, MICH., March 13—Opening the new addition to the Clarke-Carter automobile factory, a dance was held in the new building. About 225 couples enjoyed the affair. The addition is three stories in height, 300 x 50 feet, and is of red brick. The basement will be used for the blacksmith shop, while the second floor will be used for the final assembling. On the top floor the paint department will be located. The addition triples the capacity of the factory and it will be necessary to employ 100 additional men. Many of the prominent business men of the city were present at the housewarming.

Agents Inspect Flanders Model

CHICAGO, March 10—Two hundred and fourteen dealers from Illinois, Iowa, Wisconsin and the eastern half of Missouri who deal directly with the Chicago Studebaker branch were in the city yesterday as guests of the local management, the primary object of their visit being to inspect the new Flanders fore-door model and to place orders for it.

This is the start of a demonstrating trip planned by the factory which is one of the most unique attempts at educating the dealer that has ever been undertaken by a motor car concern. From here the factory officials and the moving pictures will swing around a circuit which will include Louisville, Memphis, Atlanta, Washington, Philadelphia, Pittsburg, New York, Cleveland, Columbus, Indianapolis, Toledo, Boston and Buffalo, which will require about three weeks.

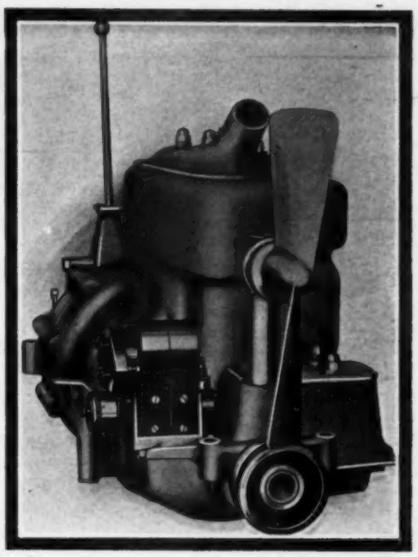


Fig. 5—Front end elevation of the King bloc motor, presenting the magneto on a shelf driven from a lateral shaft by means of an enclosed spiral gear

Merger to Increase Activity

FINDLAY, O., March 13—L. E. Ewing, president and general manager of the Findlay Motor Co., has closed the contract for the removal of the American Motor Truck Co., of Lockport, N. Y., to Findlay. Work on removal of the machinery has already begun and all will be installed soon. Additions to the Findlay Motor Co. plant now working 100 men, will be made and several hundred men will be put to work as soon as room for them can be secured. The new company will manufacture six different styles of trucks.

Changes in Cleveland Trade

CLEVELAND, O., March 13—Numerous changes among the local agencies in preparation for the spring and summer season have taken place during the week. E. A. Osborn has accepted a position in the sales department of the Overland Co. under the direction of Manager Sloan of the Auto Sales Company. Fred Wood has appointed H. C. Christy, Jr., a member of the Olds-Oakland sales force. Manager C. G. Bleasdale of the United Motor Cleveland Co. announces the appointment of V. L. Nash as manager for the Maxwell line. T. E. Patterson will act as sales manager for the entire Sampson line. W. W. Mann has recently taken charge of the local business of the Warren Speed Indicator Co. Manager Sperry of the Hupp-Yeats electric branch announces the appointment of H. D. Haupt, formerly with the Detroit Electric Co., as sales manager. Manager Hammerle of the Goodyear Rubber Co. announces the removal of the Goodyear local quarters in April to the Spencerian building, Euclid avenue and East 17th street. The Lion Motor Sales Co. will soon open salesroom at Euclid avenue and East 19th street.

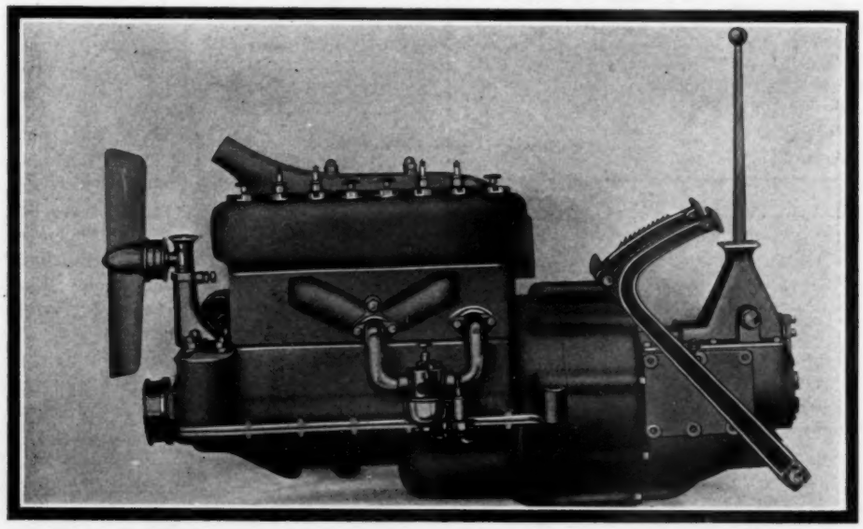


Fig. 4—Left side elevation of the King bloc motor, showing the carbureter in place, and a type of gas intake that is designed for silence

Seen in the Show Window

AN AID TO THE CARBURETER

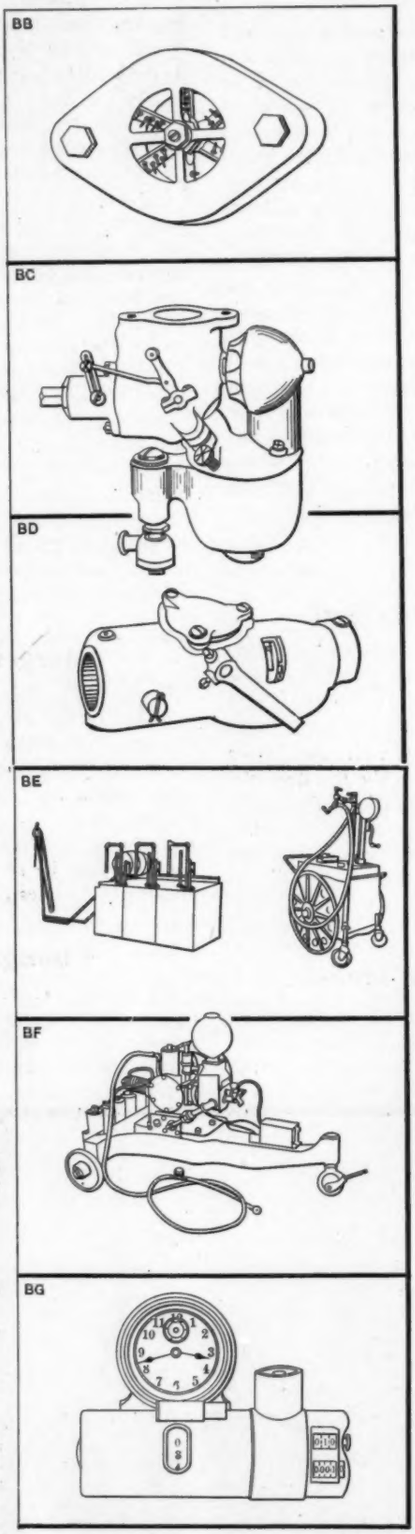
THE reduction of gasoline spray to a state of complete atomization is the principal merit claimed for the Agitator (BB), a device recently put on the market by The New Jersey Motor Equipment Company, Inc., of Elizabeth, N. J. Placed between the carbureter and the manifold intake, its business is to thoroughly disintegrate the particles of gasoline into the finest mist-like spray, thus insuring absolute firing of the mixture at each explosion. When in action the Agitator revolves with terrific speed by the suction from the motor pulling up its charge. The six fan-shaped blades, each of which is equipped with six prongs, set staggered on the hub, tear the drops of gasoline into infinitesimal particles, at the same time thoroughly mixing in the air.

MARVEL CARBURETER

THIS carbureter (BC) is of the float-feed type with inclined jet. The float chamber is formed by the bowl at the base as shown in the illustration, the gasoline being fed into it from the side through a needle valve actuated by the cork float. There is a small screw that operates a tapered needle that increases or diminishes the orifice of the jet as may be required. The air supply is taken in from the chimney with the bell top seen on the right, and through this passes the continuation of the hot-air piping. Connected with the throttle valve there is a butterfly valve that controls the flow of hot air supplied by a by-pass from the exhaust. When the throttle is nearly closed the hot-air supply valve is fully open, allowing a full flow of hot air, but as the throttle is opened this supply is diminished as the butterfly closes in the same proportion to the opening of the throttle. The hot air is passed around a jacket encircling the mixing chamber. The carbureter is manufactured by the Marvel Manufacturing Company, Alvord street, Indianapolis, Ind.

CASGRAIN SPEEDOMETER

THIS speedometer (BG) works on the hydraulic principle, having four paddle wheels that revolve in clear mineral oil. The paddles are operated by cable suitably connected to gearing from the road wheel. The rotation of the paddles causes the liquid in the cylindrical container to revolve, which transmits the movement to fins on the inside of a cylinder which carries the figure scale. The center spindle of the speedometer has a worm cut on it and the scale cylinder meshes with this in such a manner that as the cylinder rotates it has an upward motion imparted to it, bringing the different figures opposite the dial to indicate the speed of travel. A coil spring is attached to the cylinder so that as soon as the speed of the paddles diminishes the inside cylinder will run back a proportionate amount. Each figure is fitted to the cylinder by hand as each instrument is separately calibrated and the reading strip is 28 inches long. This ensures that each mile has a separate reading, each the same size. This speedometer is manufactured by the Automatic Appliances Company, 162-172 Columbus avenue, Boston.



BB—The Agitator—helps the carbureter
BC—Showing the Marvel Carbureter
BD—Foot-Operated Cut-O-Phone Signal
BE—Wayne gasoline storage outfit
BF—O. B. Portable Air Compressor
BG—Showing the Casgrain Speedometer

A SIGNAL THAT WARNS

THE foot-operated Cut-o-Phone (BD), manufactured by Skinner & Skinner Company, 1716 Michigan avenue, Chicago, is a combined cut-out and exhaust whistle operated by a single foot button, which automatically locks the cut-out open. By pressing the pedal all the way down the sound produced is comparatively mild; with the pedal at the half-way point the sound produced is peculiarly effective.

SAFE GASOLINE STORAGE AND CONVEYING APPLIANCES

OWNERS of public and private garages, if they would avoid danger to life and property loss, must devise a way to safely store and transfer from place to place in their establishments the highly volatile fuel which energizes the motors of fully 90 per cent. of the automobiles of the present day. The Wayne Oil Tank & Pump Company, of Fort Wayne, Ind., has specialized the manufacture of these devices, the illustration (BE) showing the portable and the battery outfits. The former consists of a square tank mounted on wheels and provided with a pump, hose and measuring gauge; the latter is a complete battery outfit with three fillers, barrel track and chain hoist. This company also makes a specialty of underground storage tanks, with the necessary connecting pipes and pumps to deliver the gasoline to the required point.

SAVING TIME IN THE GARAGE

LOSS of time in the garage due to antiquated equipment foots up to astonishingly large totals at the year's end. One of the most inexcusable deficiencies along this line is the retention of the old system of inflating tires by hand, which still obtains in not a few garages, public as well as private. In the O. B. Portable Air Compressor (BF), made by Oscar M. Bergstron, 310 Ninth street, South Minneapolis, Minn., the garage man is provided with a device which, mounted on wheels, may be easily transported from place to place as wanted. The compressor itself consists of a powerful pump, electrically driven.